# Indiana Department of Environmental Management

## Fall Creek TMDL Study

June 26, 2003

*Draft Report*

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# Executive Summary

Water quality data has been collected from Fall Creek in Marion County since 1991. In 1998, the Indiana Department of Environmental Management (IDEM) determined that segments of Fall Creek do not consistently comply with the state's water quality standards for *E. coli* bacteria. As a result, segments of Fall Creek were listed on the 1998 303(d) list and required to have a Total Maximum Daily Load (TMDL) evaluation for *E. coli*.

A model of Fall Creek was developed and calibrated to the existing instream data for *E. coli* bacteria. A ten-year period of time was simulated to predict resultant instream *E. coli* bacteria counts for each day of the simulation period. Data collected by several agencies was obtained for the water quality model development.

Fall Creek was divided into two segments for analysis purposes as follows:

- Fall Creek Upstream of the Combined Sewer Overflow (CSO) Area
- Fall Creek Within the CSO Area

Sources of *E. coli* in the watershed include CSOs, urban stormwater, failing septic systems, and pollutants from wildlife and domestic animals. Point sources and nonpoint sources were characterized and represented in the model for evaluation of loadings and development of load reduction scenarios to determine the required action necessary to attain water quality standards. Based on the modeling and data analyzed, the allowable TMDLs for Fall Creek were determined to be as follows:

- Fall Creek upstream of the CSO area -- **$2.32 \times 10^{11}$** colony forming units **(cfu)**, which would require an 84% reduction in the average daily bacteria load.
- Fall Creek within the CSO area -- **$2.42 \times 10^{11}$ cfu**, which would require a 99.8% reduction in the average daily bacteria load.

The modeling analysis also incorporated a representative load reduction scenario. This scenario is representative of the current and future watershed programs being pursued by the City of Indianapolis. This program consists of removing illicit sanitary connections, converting failing septic systems to sanitary sewers in the Barrett Law Program, reducing stormwater loadings per the NPDES Permit Program, and controlling CSOs per the Final CSO Long Term Control Plan (LTCP[1]). The city's current stormwater NPDES Permit program is assumed to reduce the stormwater *E. coli* bacteria load by 10 percent. An additional scenario was also developed to evaluate the water quality impacts of flow augmentation in the Fall Creek CSO area.

The performance of the city's projected programs was compared with the TMDL monthly geometric mean standard of 125 cfu/100 ml, percent of days with *E. coli*

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[1] The modeled load reduction was the recommended plan in the April 2001 Draft CSO LTCP. The recommended level of CSO control was 85% capture, or 12 overflow events per year. The final CSO LTCP is in development.

bacteria levels above the daily maximum standard of 235 cfu/100 ml, and the number of days per year with *E. coli* bacteria levels above 10,000 cfu/100 ml. The findings show that all three criteria can be met under dry weather flow conditions by the removal of failing septic systems and illicit sanitary connections. The findings also show that significant reductions in wet weather *E. coli* bacteria can be achieved by stormwater and CSO controls. However, additional load reduction may be necessary to achieve the TMDL.

# Section 1 Introduction

The State of Indiana assesses its water bodies for compliance with water quality standards criteria established for their designated uses as required by the Federal Clean Water Act (CWA). Assessed water bodies are placed into three categories depending on water quality assessment results: supporting, partially supporting, or not supporting their designated uses. These water bodies are found on Indiana's 305(b) list, which is published every two years, as required by that section of the CWA that defines the assessment process.

Some of the 305(b) partially and not supporting water bodies are also assigned to Indiana's 303(d) list, also named after a section of the CWA. Water bodies on the 303(d) list are required to have a TMDL evaluation for the water quality constituent(s) in violation of the water quality standard. The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollution sources and instream water quality conditions. This allows water quality-based controls to be developed to reduce pollution and restore and maintain water quality.

*E. coli* bacteria data collected from Fall Creek by the IDEM indicate that the *E. coli* bacteria standard is exceeded from Emerson Avenue to the confluence with the West Fork of the White River. As a result, this segment of Fall Creek was added to the State's 1998 303(d) list and scheduled for a TMDL evaluation.

# Section 2
# Background Information

The area relevant for this TMDL report consists of Fall Creek from Geist Reservoir to the confluence with the White River. The section from Emerson Way to the confluence with the West Fork of the White River does not consistently meet the Indiana bacteria (*E. coli*) water quality standard both during dry and wet weather.

## 2.1 Parameter of Concern

Section 303(d) for the state of Indiana was updated in 1998 and lists one parameter of concern for Fall Creek within the study area described above: *E. coli* bacteria.

Section 303(d) of the Clean Water Act provides that states are to list waters for which technology-based limits alone do not ensure attainment of water quality standards. States are to list and set priority rankings for their listed impaired waters. To address water body segments on the 303(d) list, states are required to develop TMDLs that allow these segments to attain water quality standards. This report presents instream data as well as modeling results and future load allocations for *E. coli* on Fall Creek.

## 2.2 Water Quality Standards

IDEM has promulgated water quality standards to protect designated uses of waterways. These standards include numeric recreational use standards for *E. coli* bacteria, which can be used as target values for the TMDL.

The applicable bacteria standard for *E. coli* is as follows:

> *… for full body contact recreational uses E. coli bacteria, using membrane filter (MF) count, shall not exceed one hundred twenty-five (125) per one hundred (100) milliliters as a geometric mean based on not less than five (5) samples equally spaced over a thirty (30) day period nor exceed two hundred thirty-five (235) per one hundred (100) milliliters in any one (1) sample in a thirty (30) day period*

*E. coli* is used as the water quality indicator and the target values are:

- Monthly geometric mean not to exceed 125 cfu/100 ml
- Monthly maximum not to exceed 235 cfu/100 ml.

# Section 3
# Data Sources and Initial Assessment

Data characterizing the amount of pollutants entering Fall Creek from various sources were collected. These sources cause exceedances of the Indiana water quality standard for *E. coli* bacteria. This section describes the sources of the data collected for review and includes an assessment of compliance for this parameter.

## 3.1 Data Sources

Data characterizing *E. coli* bacteria were obtained from the following sources:

- City of Indianapolis Department of Public Works Office of Environmental Services (OES),
- Marion County Health Department (MCHD), and
- Indiana Department of Environmental Management (IDEM).

## 3.2 Sampling Locations

Data for *E. coli* bacteria were collected at various intervals and locations by the three agencies. The sampling locations for each agency are shown on **Figure 3.1**.

The City of Indianapolis has collected samples and performed *E. coli* bacteria analysis at two locations on Fall Creek. These samples were analyzed and continue to be analyzed on a monthly basis from May 1991 to present. Sampling locations are:

- 71$^{st}$ Street
- 16$^{th}$ Street

The MCHD has collected samples on a monthly basis at two sites on Fall Creek. Samples were also taken five times per month at seven sites on Fall Creek. The locations of the sampling stations along with their corresponding sampling dates and sampling frequency are shown below.

- Emerson Way – January 1997 to March 2002 – Samples Taken 5 Times per Month
- 38$^{th}$ Street – April 2001 to March 2002 – Samples Taken 5 Times per Month
- 30$^{th}$ Street – January 1997 to March 2002 – Samples Taken 5 Times per Month
- Central Avenue – January 1997 to March 2002 – Samples Taken 5 Times per Month
- Capitol Avenue - January 1997 to March 2002 – Samples Taken 5 Times per Month
- Dr. Martin Luther King Jr. Street– January 1997 to March 2002 – Samples Taken 5 Times per Month
- Stadium Drive - January 1997 to March 2002 – Samples Taken 5 Times per Month
- 5700 Fall Creek Parkway N. Drive – April 1999 to October 2001 – Samples Taken Monthly

- 4500 Fall Creek Parkway N. Drive – June 1997 to October 2001 – Samples Taken Monthly

Additionally, in 2002 OES and MCHD performed sampling at several locations along streams of interest to supplement the existing *E. coli* data for the TMDL project. Data was collected from these stations five times per month from April 2002 to October 2002. The following is a list of all sites:

- 79th Street and Fall Creek
- 71st Street and Fall Creek
- Emerson Way and Fall Creek
- 46th Street and Fall Creek
- Keystone Avenue and Fall Creek
- 39th Street and Fall Creek
- Boy Scout Road and Fall Creek
- 30th Street and Fall Creek
- Central Avenue and Fall Creek
- Capitol Avenue and Fall Creek
- Dr. Martin Luther King Jr. Street and Fall Creek
- 16th Street and Fall Creek
- Stadium Drive and Fall Creek
- Schafer Road and Lawrence Creek in the Fall Creek watershed
- Radnor Road and Devon Creek in the Fall Creek watershed
- Millersville Road and Devon Creek in the Fall Creek watershed
- 96th Street and Mud Creek
- 86th Street and Mud Creek
- 82nd Street and Mud Creek
- Lantern Road and Mud Creek
- Fall Creek Road and Mud Creek

IDEM has also collected monthly data at two sites on Fall Creek from February 1991 to December 2000. These locations are:

- Keystone Avenue near Indianapolis Water Company intake
- Stadium Drive

## 3.3 Data Review and Initial Findings

CDM has reviewed the available data for Fall Creek within Marion County for use in performing a TMDL for *E. coli* bacteria. All data collected by OES, MCHD, and IDEM is considered to have received quality assurance checks by the respective collecting entity (OES, MCHD, or IDEM). In addition, IDEM has approved the use of OES and MCHD data for this analysis. Additional data checking was not performed as part of this project. Data flagged by the collecting entity as questionable are presented in the attached graphs and noted as being questionable, but they have not been used for determination of compliance.

All accepted data are considered comparable. OES and TMDL sampling (April 2002-October 2002) used the same method for comparison purposes. That is, where data is collected by more than one entity at a particular monitoring location, the data sets are combined for the assessment of compliance with the applicable standard.

Data plots of all stations and compliance plots for Fall Creek are found in **Figures 3.2 through 3.8**. The following paragraphs summarize the findings from each source and the overall percent compliance with Indiana water quality standards for data from January 2000 to December 2001.

A comparison of the available data was made to both the maximum monthly *E. coli* standard of 235 cfu/100 ml and the monthly geometric mean standard of 125 cfu/100 ml for the recreational season of April to October. Overall findings are:

- More than 90 percent of the sampling stations have exceeded the daily maximum *E. coli* standard more than 50 percent of the time.

- All of the sampling stations with sufficient data (5 samples in 30 days) exceed the geometric mean *E. coli* standard 70 percent of the time.

*E. coli* bacteria exceedances occur at all stations on Fall Creek, as shown in data and compliance plots provided on Figures 3.2 through 3.8. The upstream sampling station at 71$^{st}$ Street has a high percent compliance with the bacteria standard; nearly 78% of the time the instream value is less than the daily maximum limit of 235 cfu/100 ml. For the other stations on Fall Creek, there is a low percent compliance with bacteria standards, most below 50% compliance with the daily maximum limit and less than 25% for the geometric mean standard.

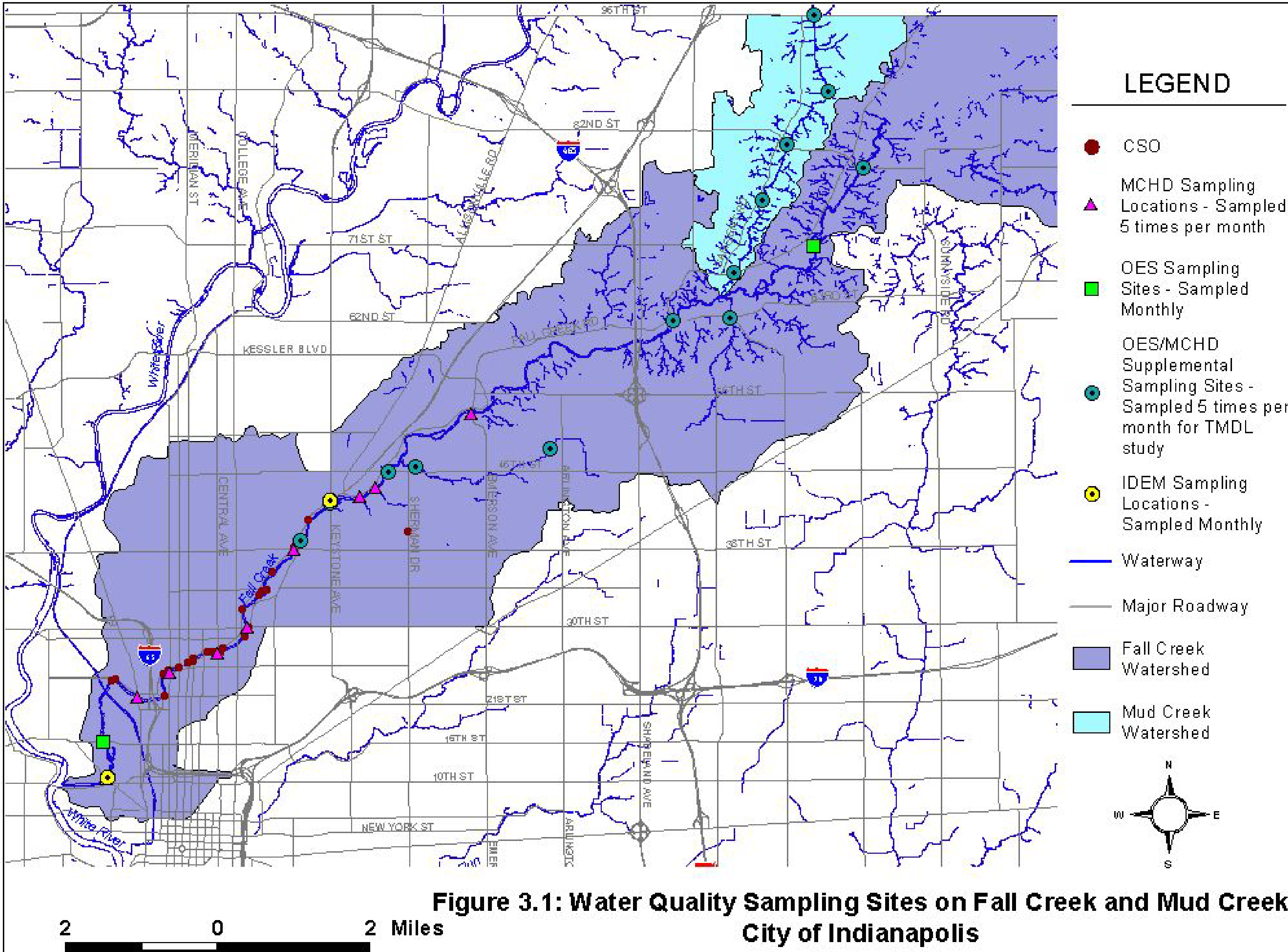
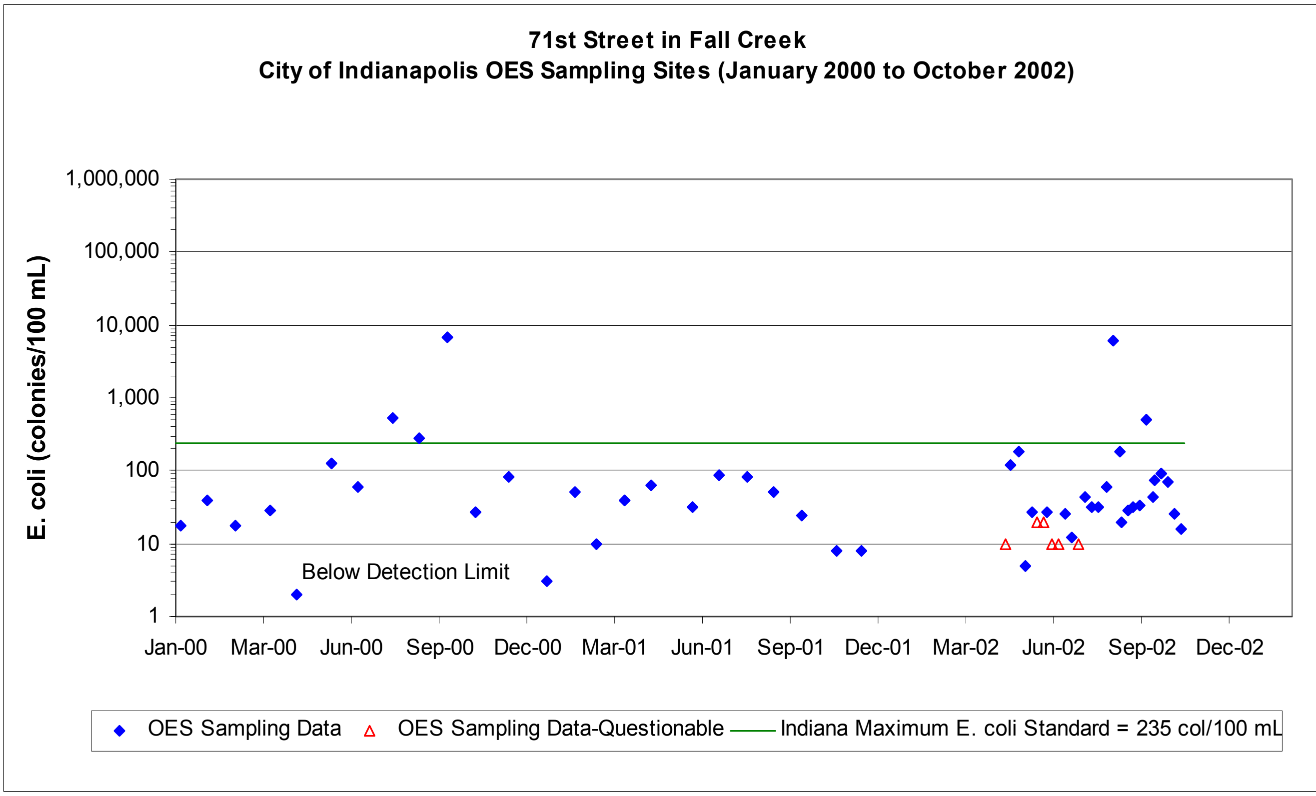
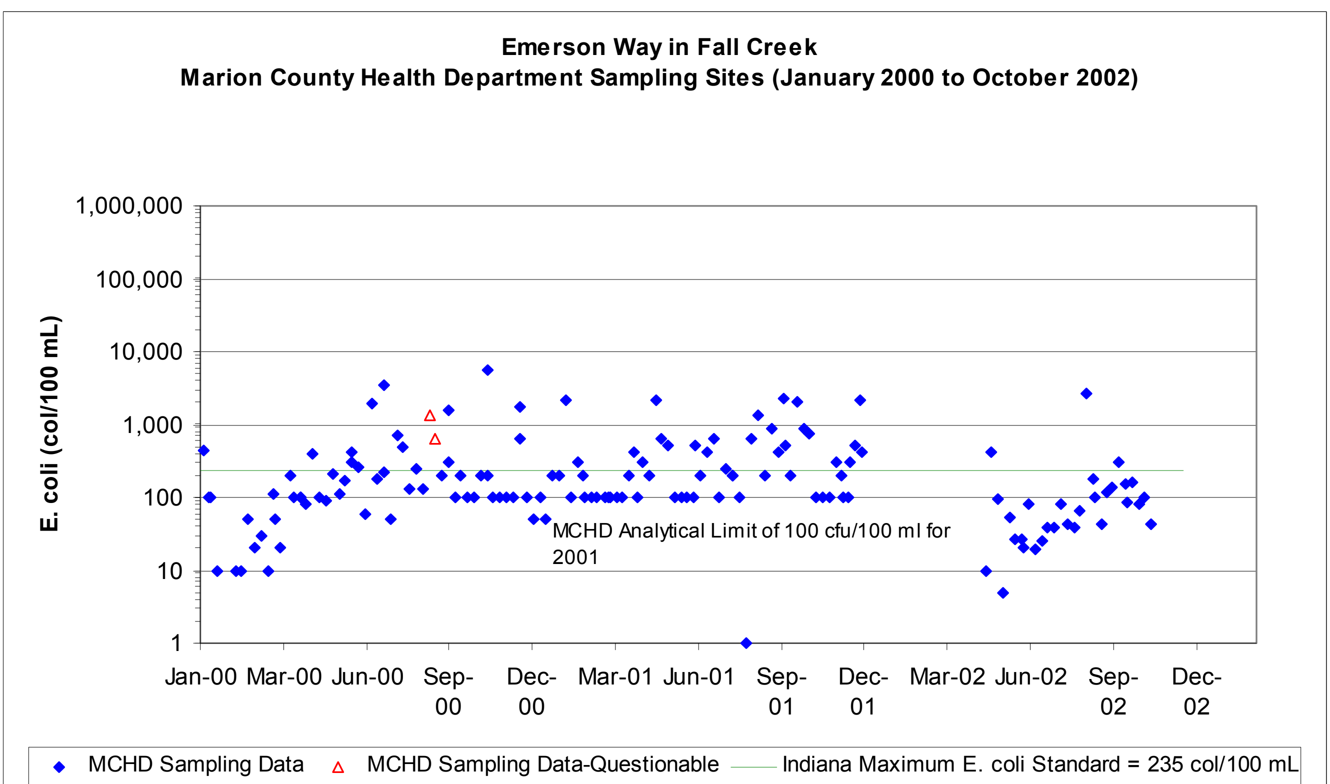


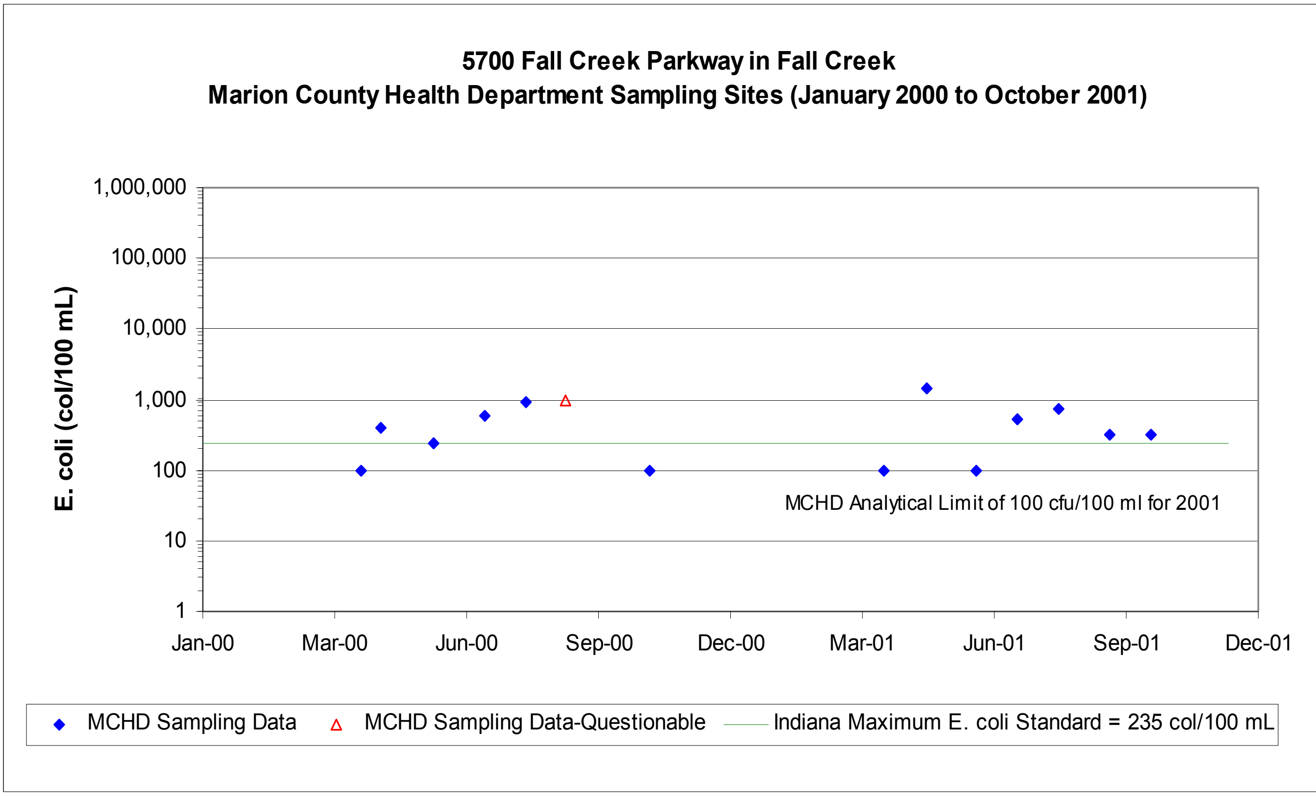

**Figure 3.1: Water Quality Sampling Sites on Fall Creek and Mud Creek**
**City of Indianapolis**
**As of Spring 2002**

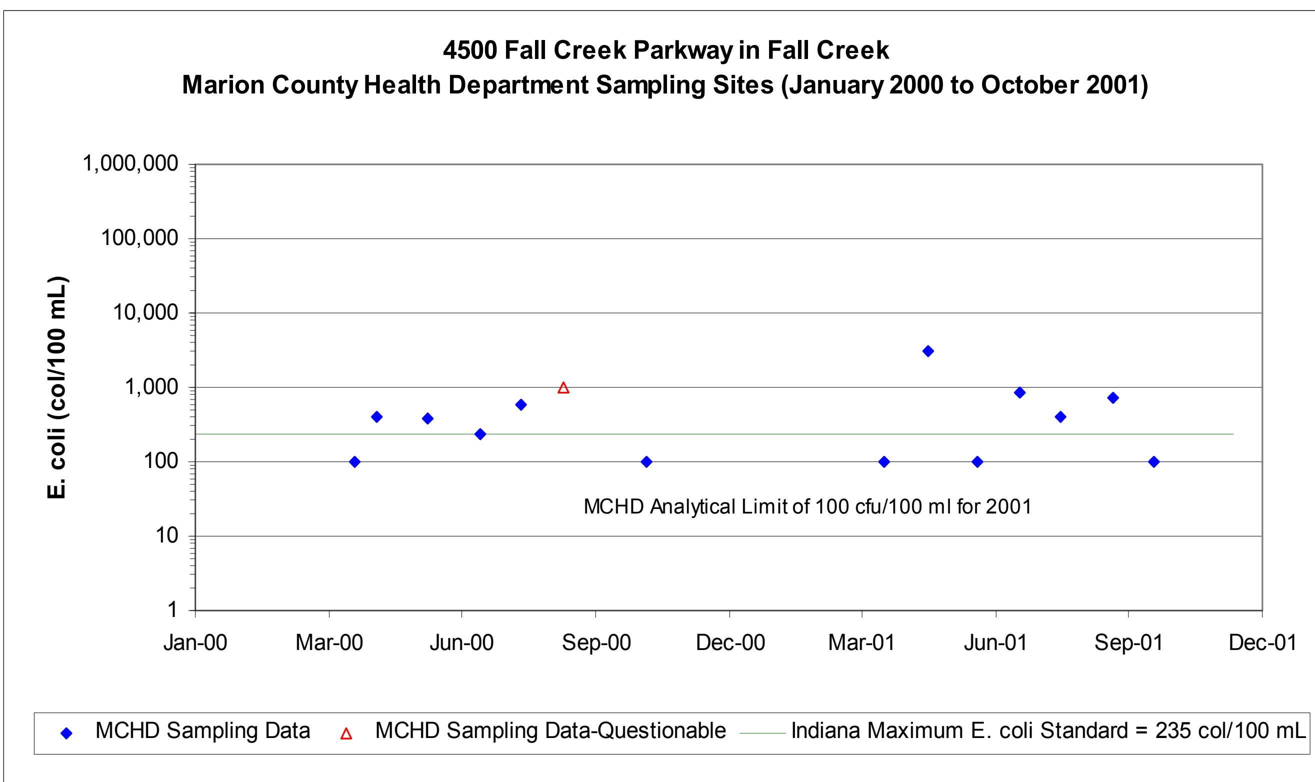
# Figure 3.2: Fall Creek *E. coli* Data Plots



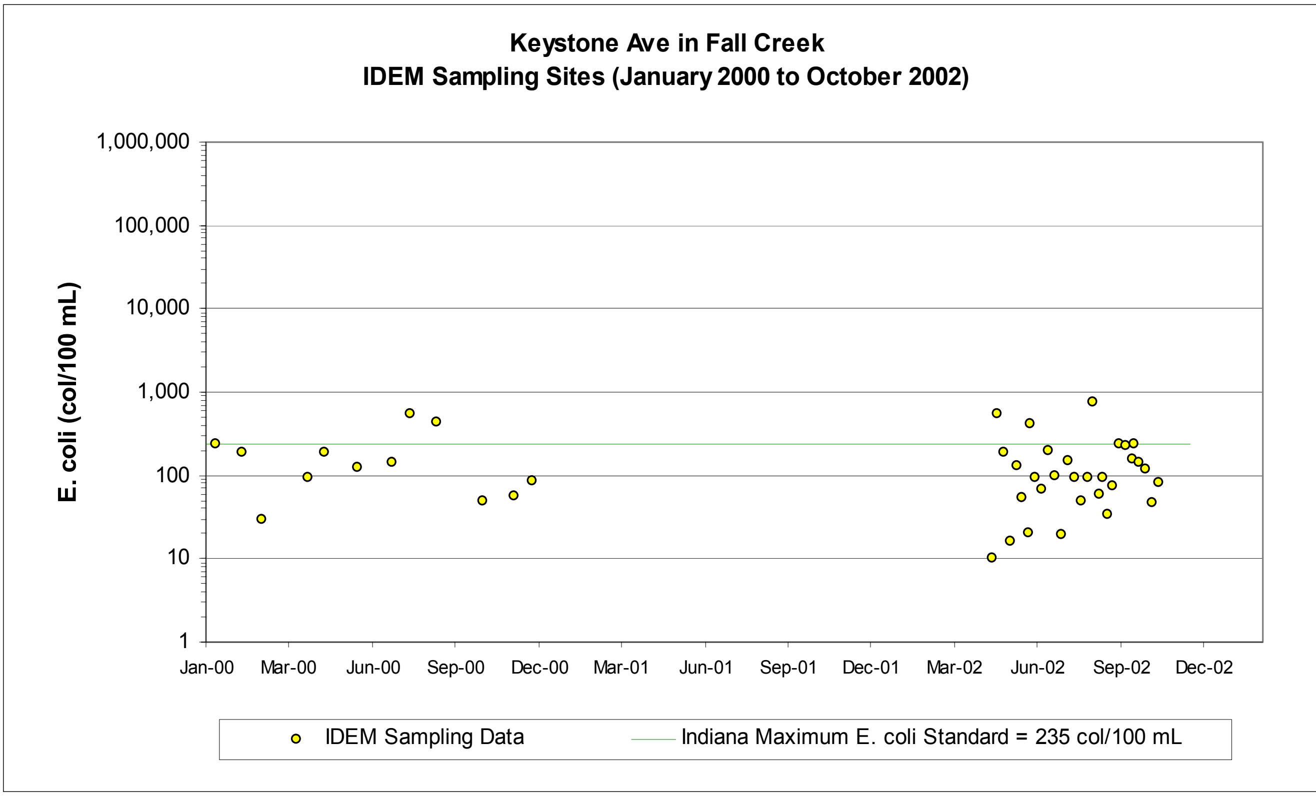



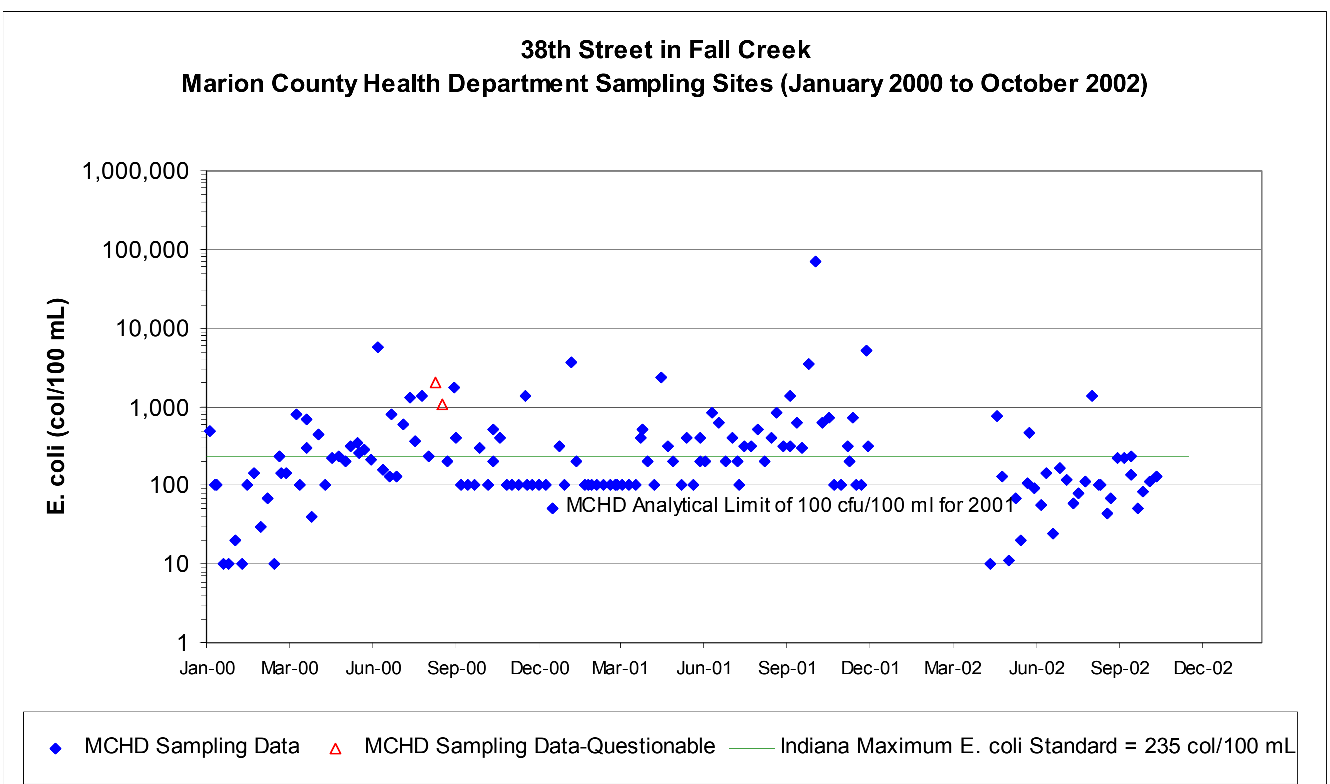
# Figure 3.3: Fall Creek *E. coli* Data Plots



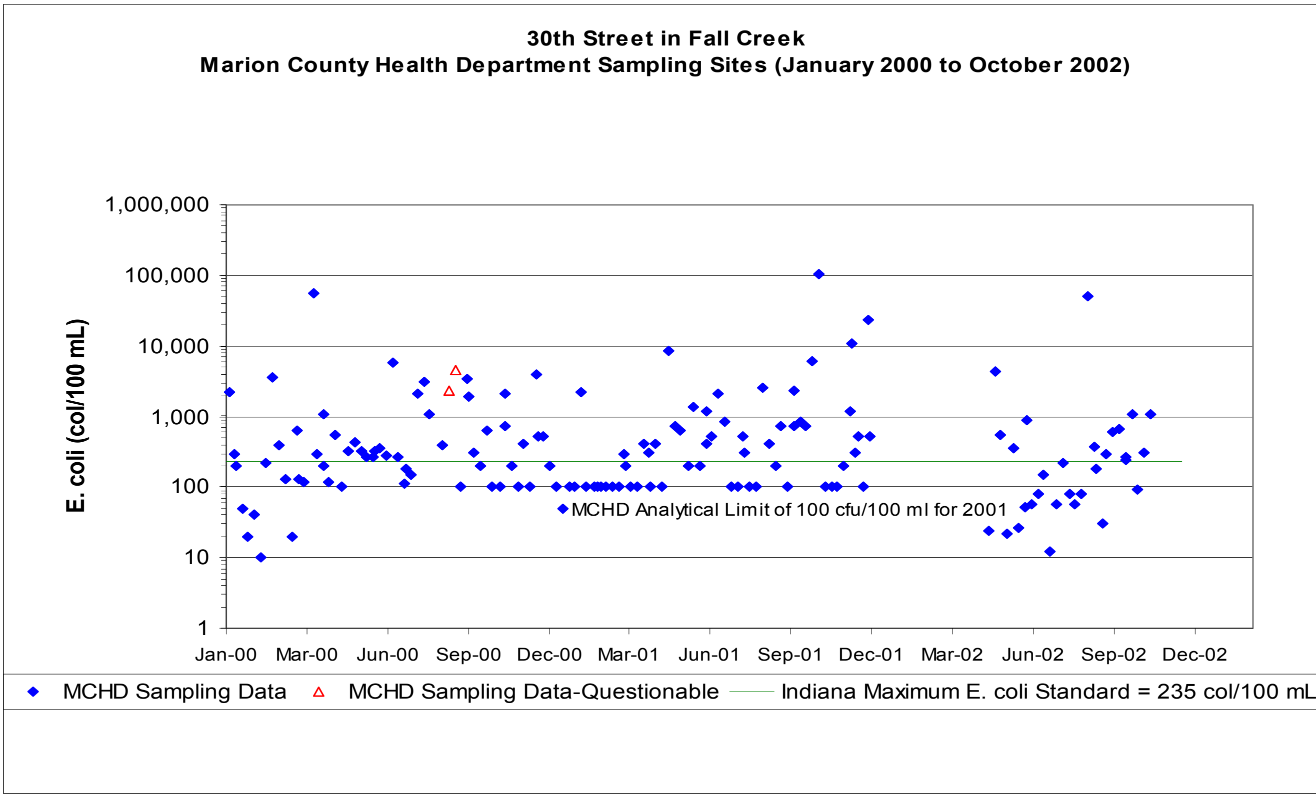



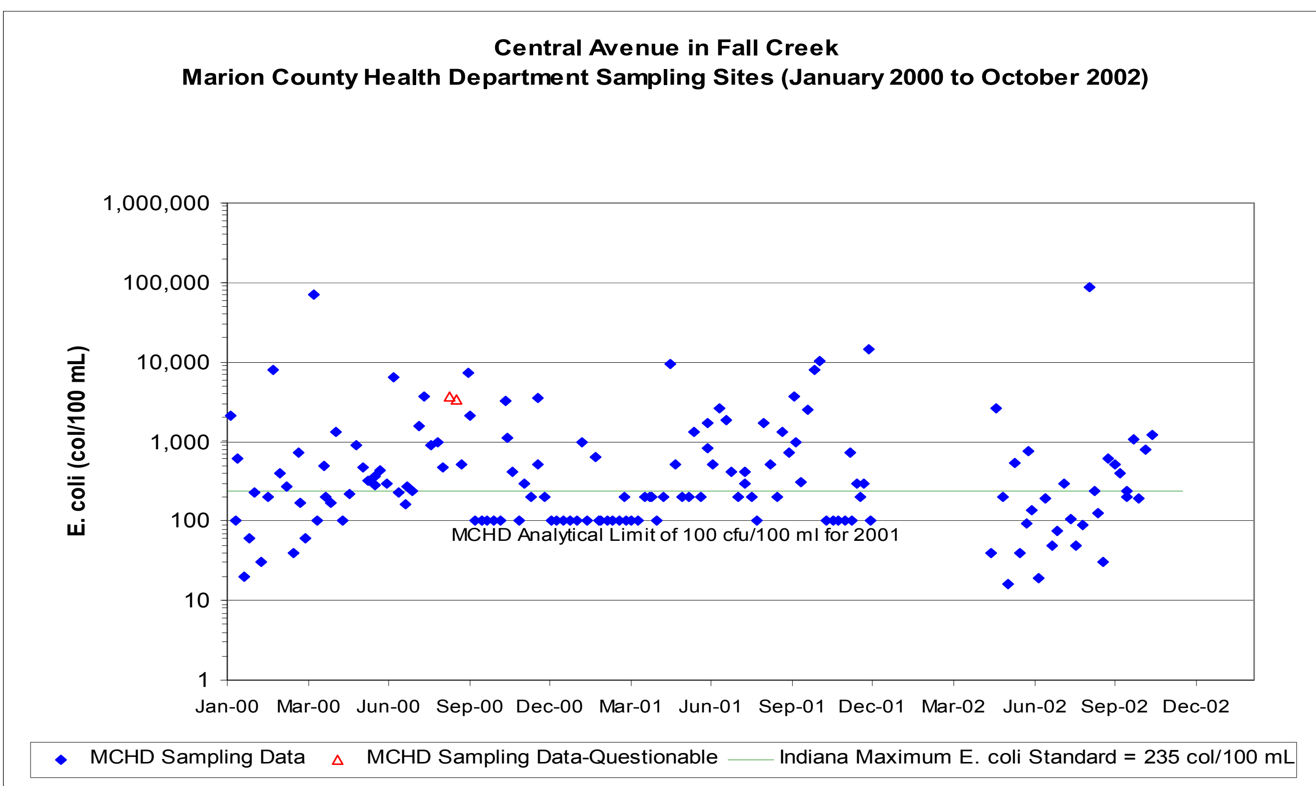
# Figure 3.4: Fall Creek *E. coli* Data Plots



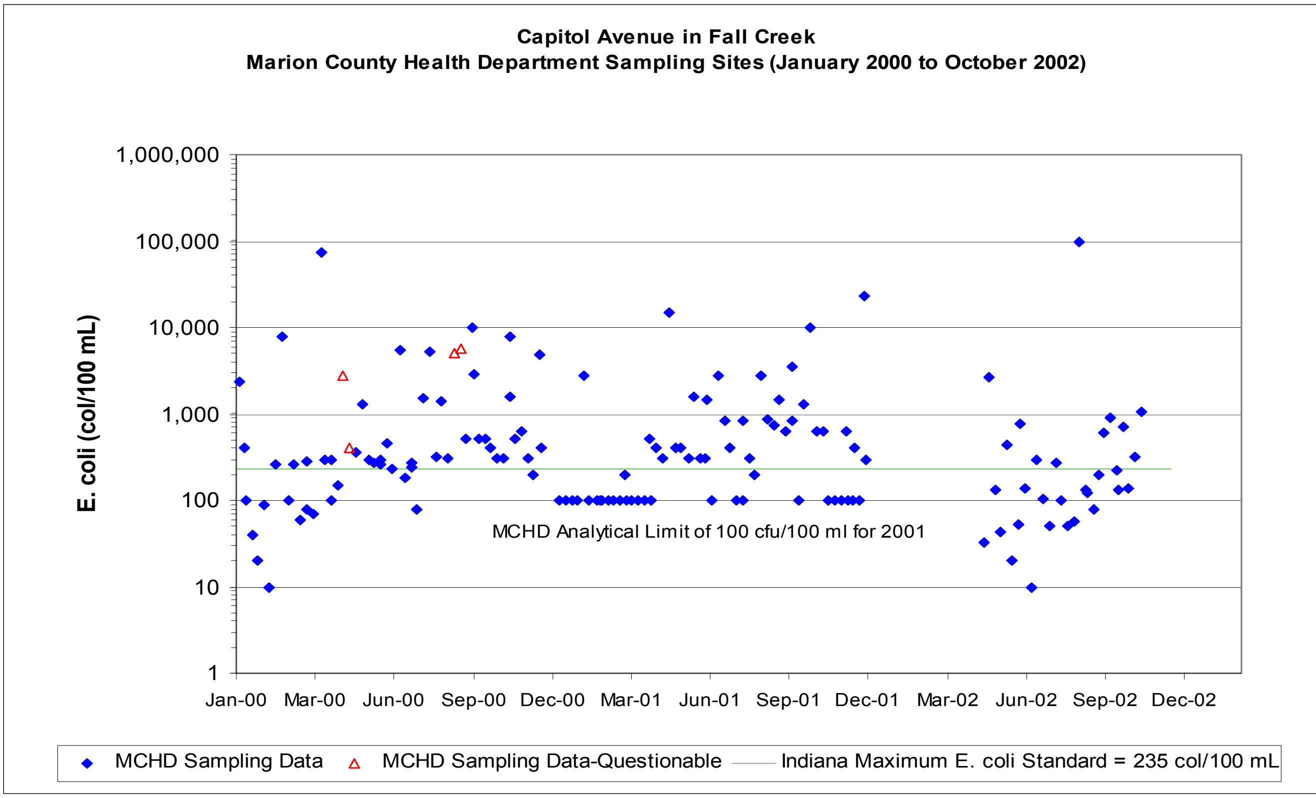



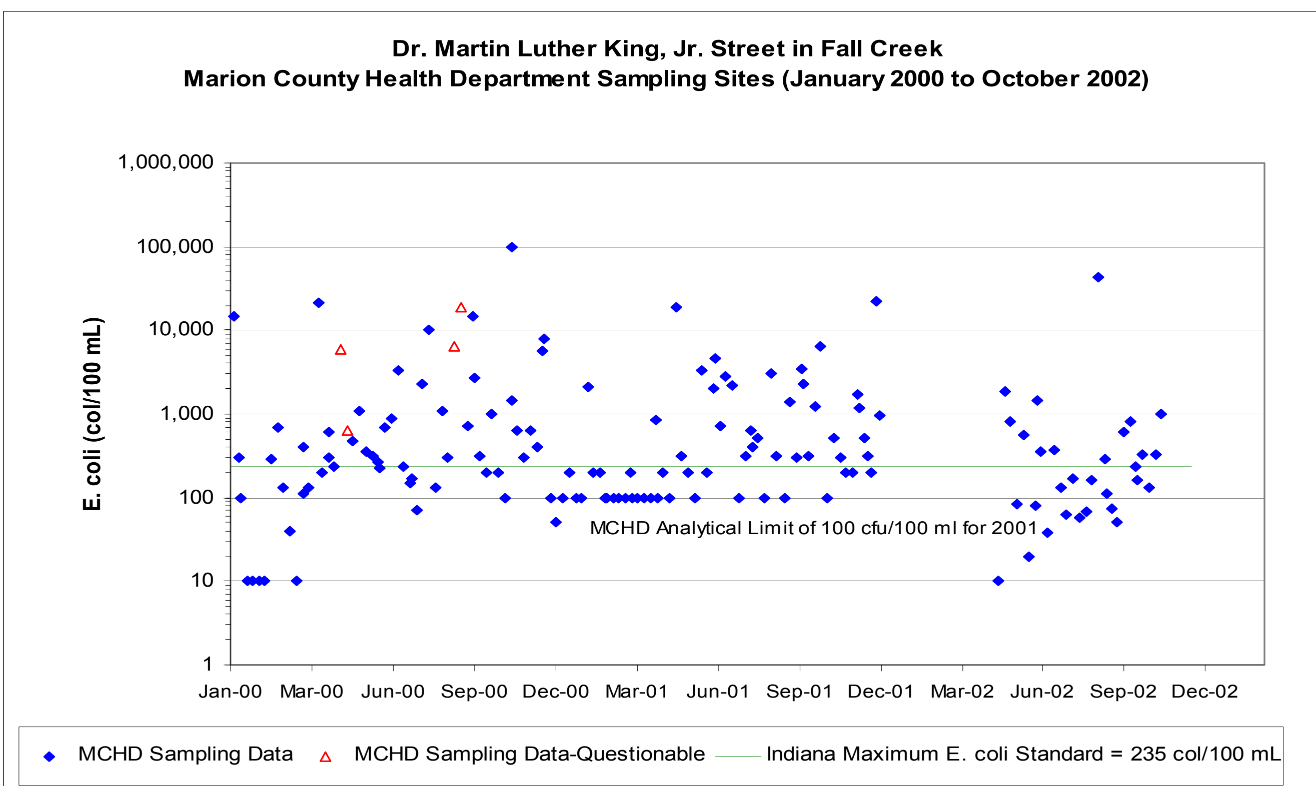
# Figure 3.5: Fall Creek *E. coli* Data Plots



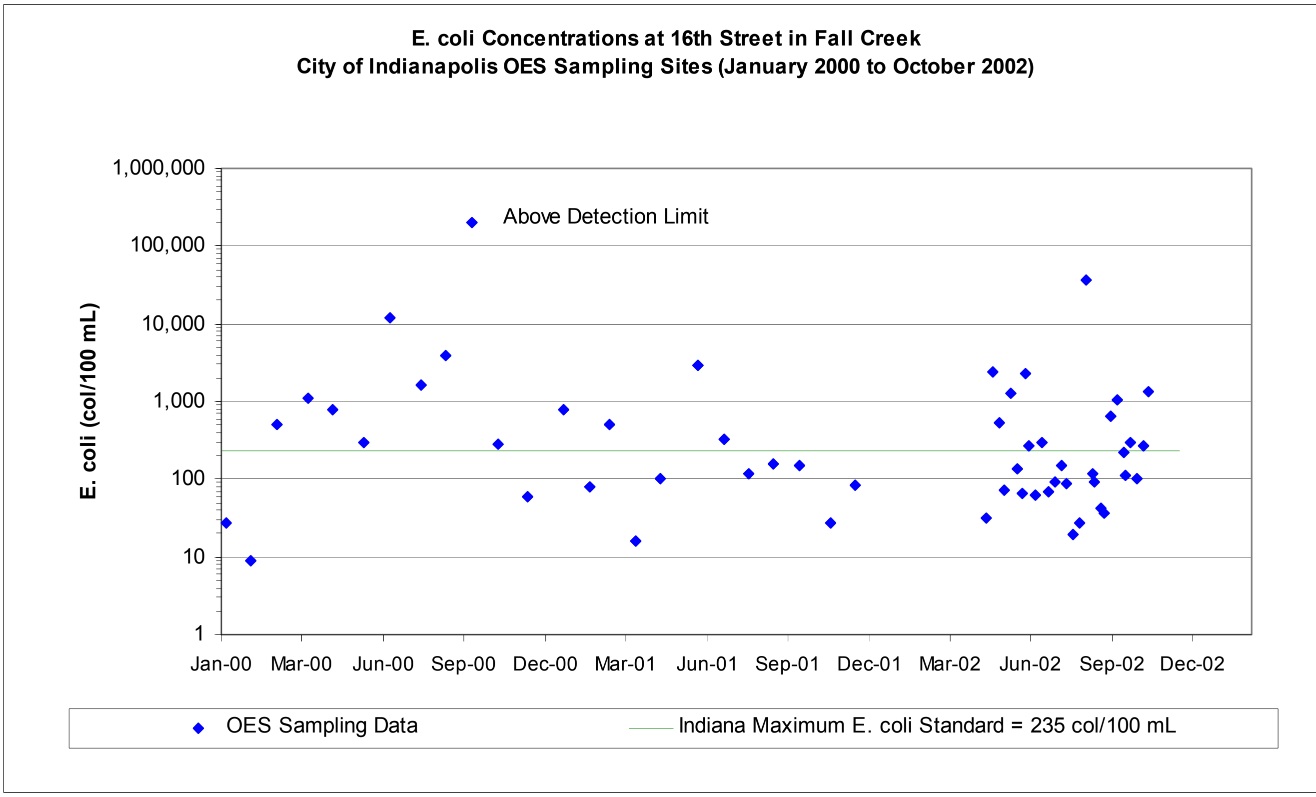



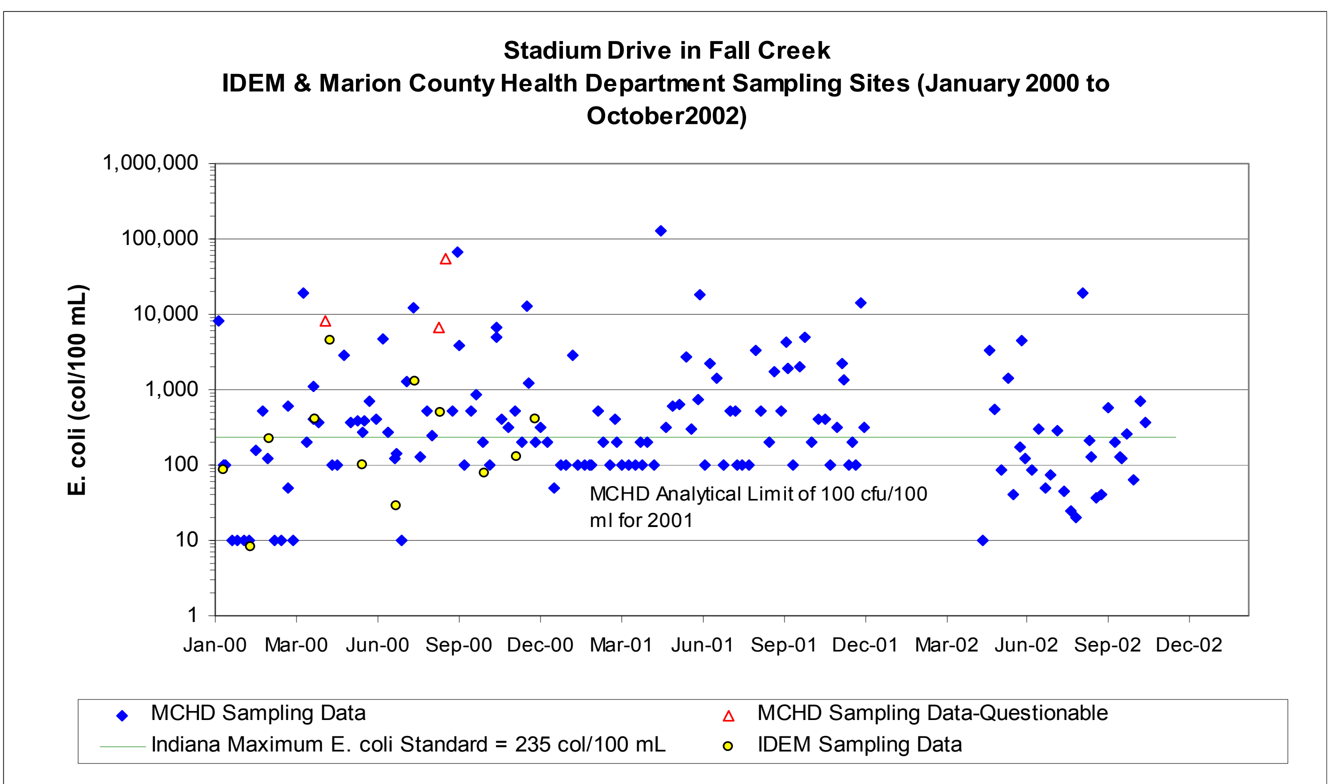
# Figure 3.6: Fall Creek *E. coli* Data Plots



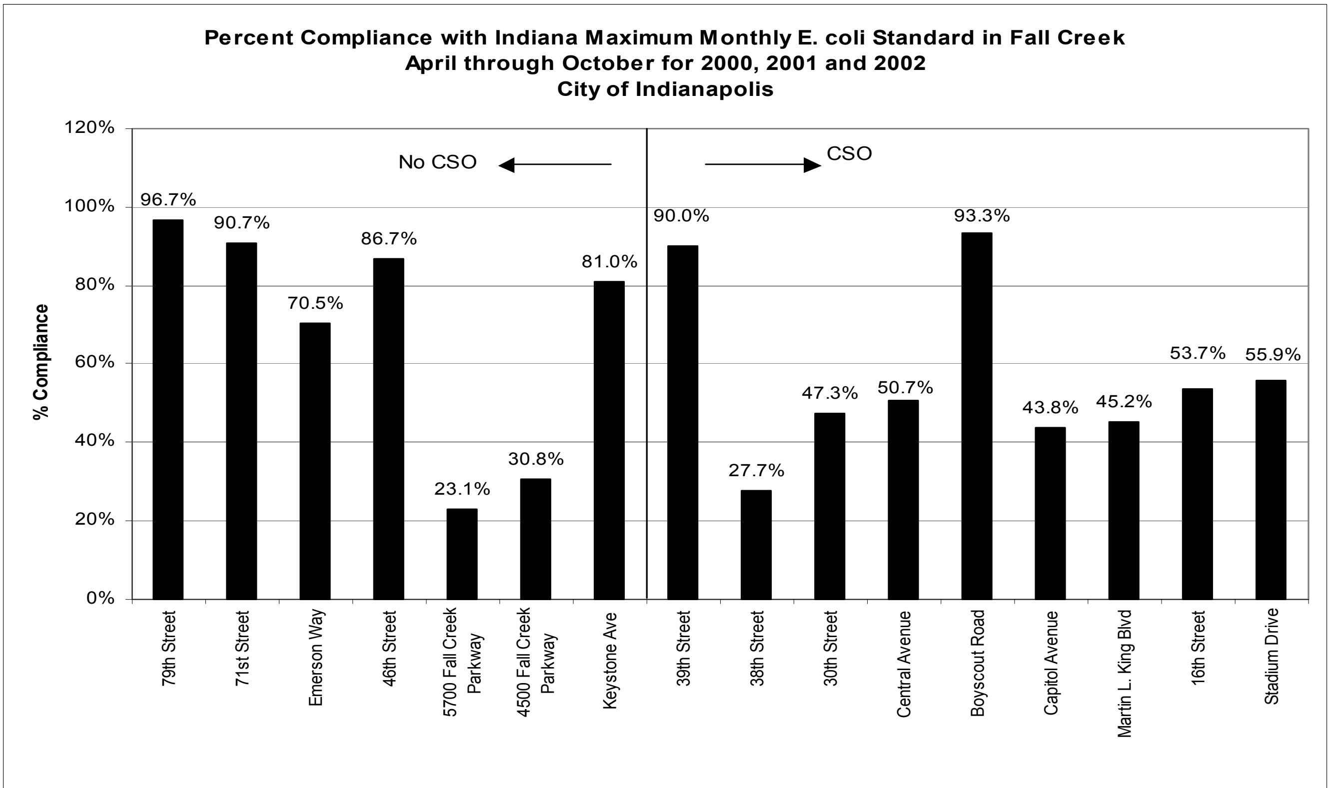



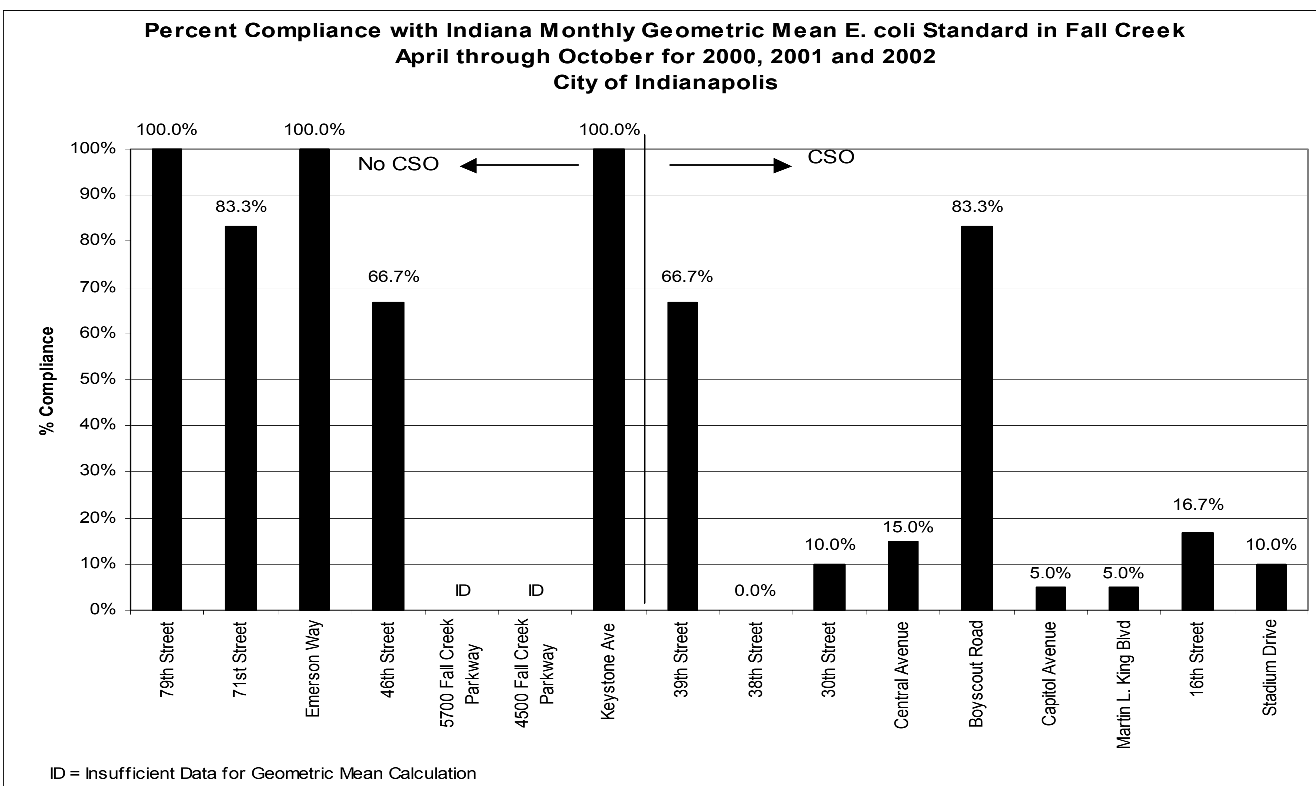
# Figure 3.7:  Fall Creek *E. coli* Data Plots



# Figure 3.8: Fall Creek *E. coli* Data Plots



# Section 4
# Water Quality Characterization

A watershed model was used to simulate the bacteria sources for both dry and wet weather sources. The model further breaks down wet weather bacteria sources into CSOs and urban/residential nonpoint sources. Additional work was performed to further define the sources of dry weather bacteria and the components of urban/residential nonpoint source wet weather contaminants.

The previous section documents the existing water quality for Fall Creek. The analysis indicates that the *E. coli* bacteria standard of 125 cfu per 100 ml (geometric mean of five samples collected over 30 days) and 235 cfu/100 ml (maximum day value) are often exceeded on the stream from Emerson Way to the confluence with West Fork White River.

## 4.1 Compliance Evaluation

*E. coli* bacteria data for 2000, 2001, and 2002 were analyzed for compliance with three reference criteria as follows:

- IDEM's geometric mean water quality standard for *E. coli* which is 125 cfu/100 ml or less,
- IDEM's 303(d) Listing Methodology (2002) guidance of no more than 10 percent of samples be above 235 cfu/100 ml, and
- IDEM's 303(d) Listing Methodology (2002) guidance of no sample having an *E. coli* level greater than 10,000 cfu/100 ml.

For this analysis, the *E. coli* bacteria data was separated into two categories, wet weather and dry weather. Wet weather is defined as any days with precipitation (greater than trace amounts) and the three days following that precipitation. Dry weather is any time other than wet weather.

In addition, Fall Creek was divided into two segments for analysis purposes as follows:

- Fall Creek Upstream of the CSO Area
- Fall Creek Within the CSO Area

*E. coli* bacteria data were grouped for each segment, one group for all data collected upstream of the CSO area and one group for all data collected within the CSO area. For informational purposes, data from major tributaries - Mud Creek, Lawrence Creek and Devon Creek - were also analyzed, but not explicitly modeled. **Table 4.1** and **Figure 4.1** show the study area extent of each stream segment for Fall Creek and its tributaries.

**Table 4.2** provides a summary of the *E. coli* bacteria sampling program for the stream segments compared to the three reference *E. coli* compliance criteria number and presents the findings of the compliance analysis for the two segments on Fall Creek. **Figures 4.2 through 4.6** present the findings graphically.

### 4.1.1 All Weather Analysis

Two segments, upstream Fall Creek and Mud Creek, have geometric mean values lower than the Indiana geometric mean standard of 125 cfu/100 ml. However, neither stream is in compliance with the reference criteria of less than 10% of samples below 235 cfu/100 ml, and Mud Creek had an observed count above 10,000 cfu/100 ml. The analysis suggests that Fall Creek upstream of the CSO area and Mud Creek possess sufficient baseflow to absorb the *E. coli* bacteria load on a "typical" day, but receive excessive *E. coli* loadings from stormwater and septic sources during wet weather or low flow, dry weather days. The other three segments, Fall Creek within the CSO Area, Devon Creek, and Lawrence Creek, are not in compliance with the Indiana geometric mean standard of 125 cfu/100 ml or the reference criteria of less than 10% of samples below 235 cfu/100 ml. The analysis suggests that these streams are not able to accept the *E. coli* bacteria load from wildlife, septic, and stormwater sources. The thirty samples in excess of 10,000 cfu/100 ml in the Fall Creek CSO area in an eighteen-month period imply that CSOs are a dominant source of *E.* coli in the watershed.

### 4.1.2 Dry Weather Analysis

One stream segment, Mud Creek, is in compliance with all three reference criteria during dry weather. The analysis suggests that the septic and wildlife *E. coli* bacteria loads to the watershed are reasonable for the dry weather baseflow. Two other stream segments, Fall Creek upstream of the CSO area and Lawrence Creek, are in compliance with the Indiana geometric mean standard of 125 cfu/100 ml, but not the reference criteria of less than 10% of samples below 235 cfu/100 ml. The analysis suggests that although the streams possess sufficient baseflow to absorb the *E. coli* load during a "typical" dry weather day, frequent low flow conditions or fluctuations in the septic or wildlife loads occur more than 10% of the time during dry weather. Two stream segments, Fall Creek within the CSO area and Devon Creek, are not in compliance with the Indiana geometric mean standard of 125 cfu/100 ml or the reference criteria of less than 10% of samples below 235 cfu/100 ml. The analysis suggests that the septic and wildlife loadings are excessive for the stream. The contrast of the performance for Fall Creek upstream and within the CSO area suggests that the water withdrawn by Indianapolis Water at 38$^{th}$ Street has a profound effect on *E. coli* bacteria levels in the watershed.

### 4.1.3 Wet Weather Analysis

All five stream segments are not in compliance with the Indiana geometric mean standard of 125 cfu/100 ml or the reference criteria of less than 10% of samples below 235 cfu/100 ml. The analysis suggests that each stream segment receives excessive *E. coli* bacteria loadings from stormwater. The observed wet weather geometric mean and the thirty samples in excess of 10,000 cfu/100 ml in the Fall Creek CSO area in an eighteen-month period imply that CSOs are a dominant source of *E.* coli in the watershed.

# Figure 4.1: Stream Segments on Fall Creek, Mud Creek, Devon Creek and Lawrence Creek

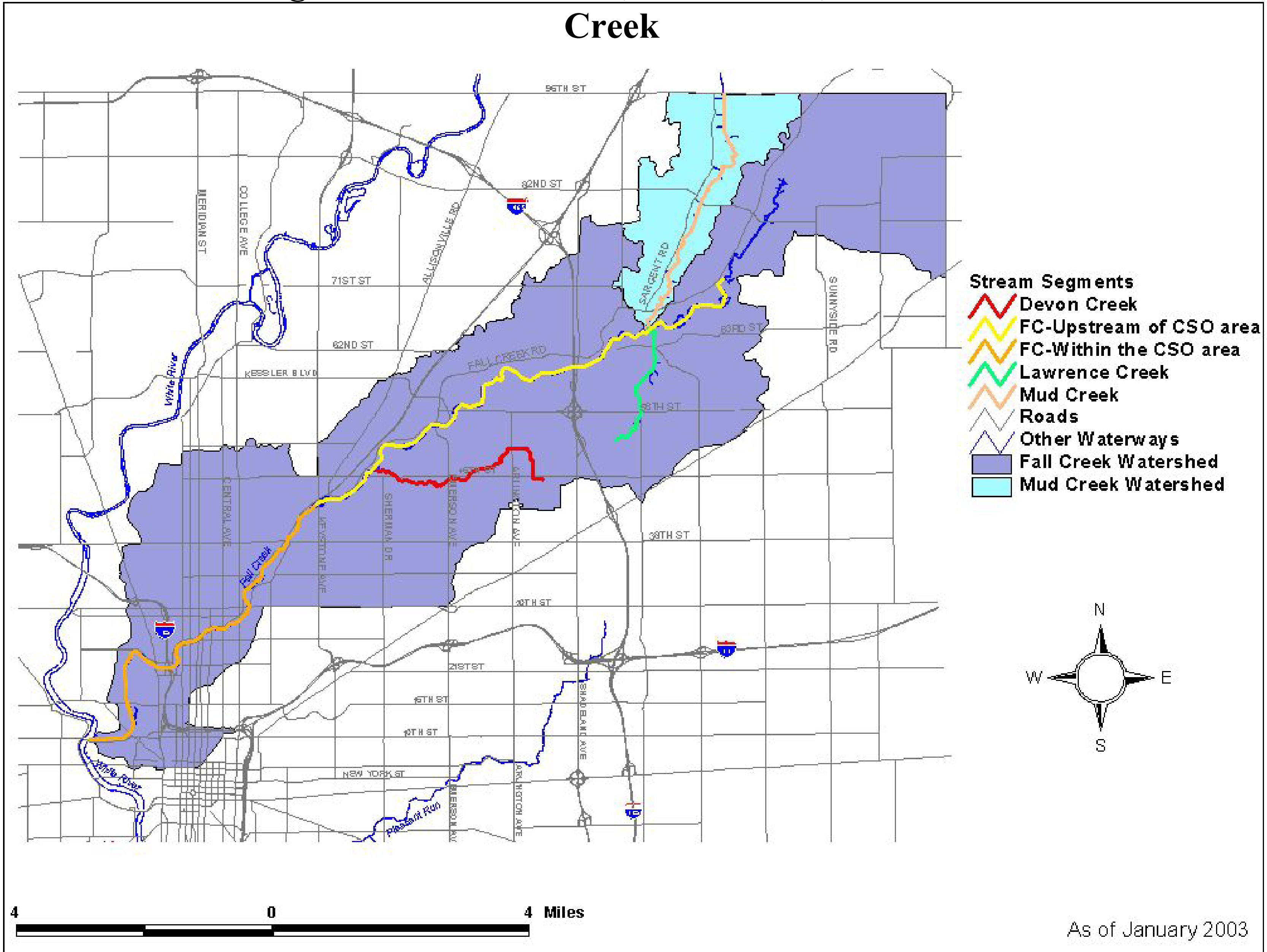
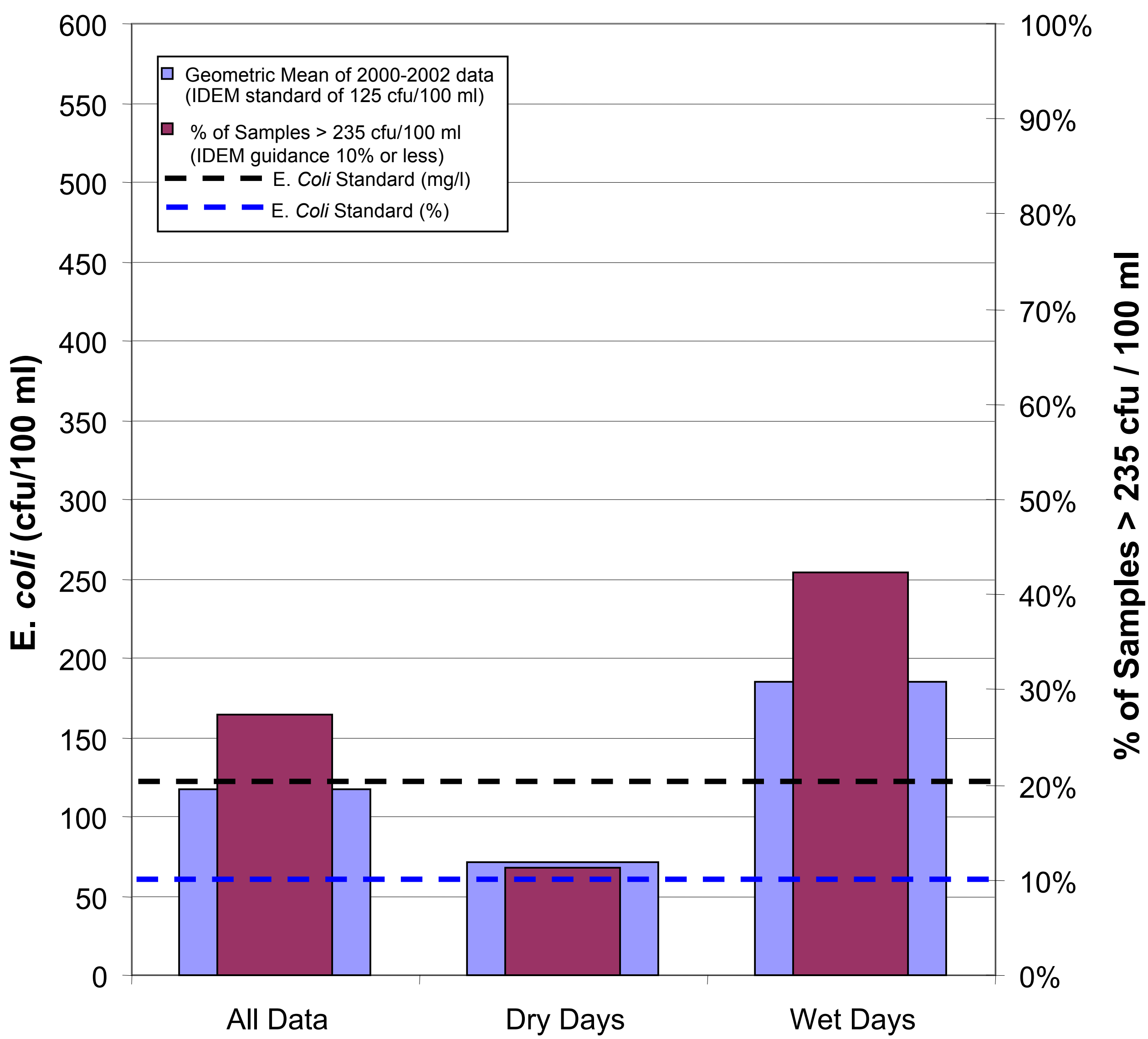


Figure 4.2: E*. coli* Bacteria Compliance
Fall Creek Upstream of CSO Area
(Based on 2000 to 2002 Data)
City of Indianapolis
Stream Miles 6.7 to 16.2



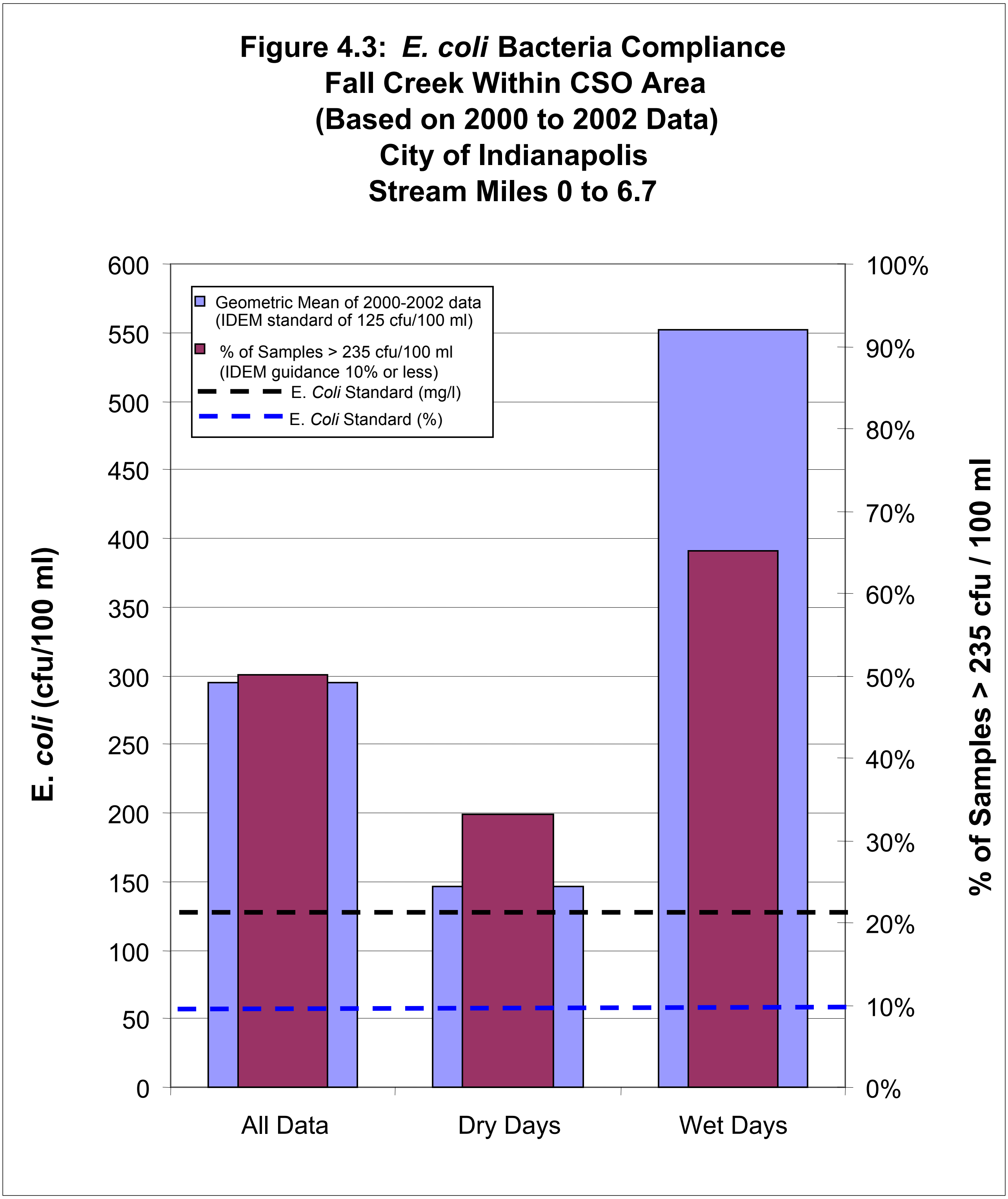


Figure 4.3: E. coli Bacteria Compliance
Fall Creek Within CSO Area
(Based on 2000 to 2002 Data)
City of Indianapolis
Stream Miles 0 to 6.7
Geometric Mean of 2000-2002 data (IDEM standard of 125 cfu/100 ml)
% of Samples > 235 cfu/100 ml (IDEM guidance 10% or less)
E. Coli Standard (mg/l)
E. Coli Standard (%)
E. coli (cfu/100 ml)
% of Samples > 235 cfu / 100 ml
600
550
500
450
400
350
300
250
200
150
100
50
0
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
All Data
Dry Days
Wet Days

**Figure 4.4: *E. coli* Bacteria Compliance**
**Mud Creek**
**(Based on 2000 to 2002 Data)**
**City of Indianapolis**
**Stream Miles 0 to 6.6**

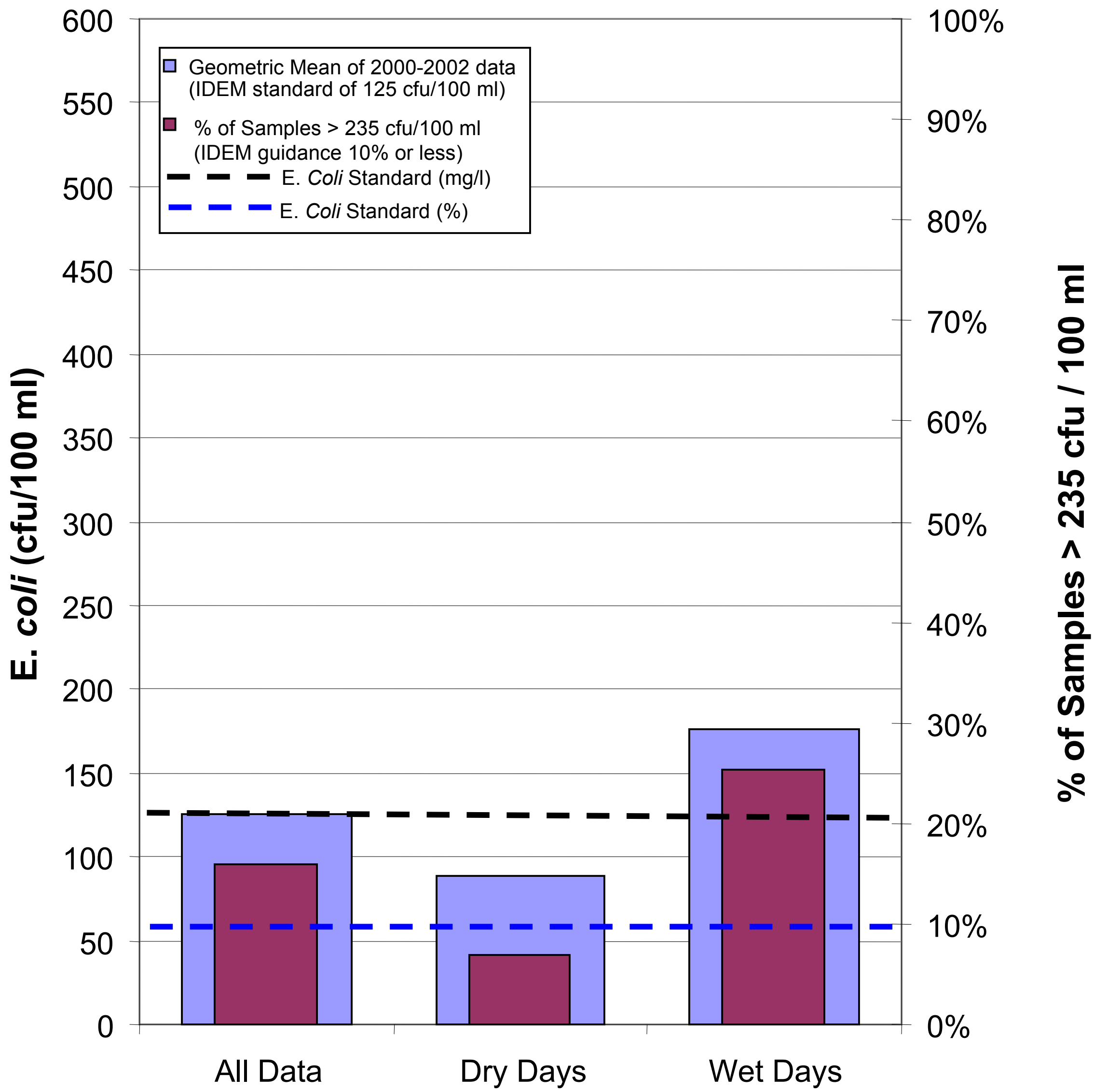


**Figure 4.5: *E. coli* Bacteria Compliance**
**Devon Creek**
**(Based on 2000 to 2002 Data)**
**City of Indianapolis**
**Stream Miles 0 to 3.5**

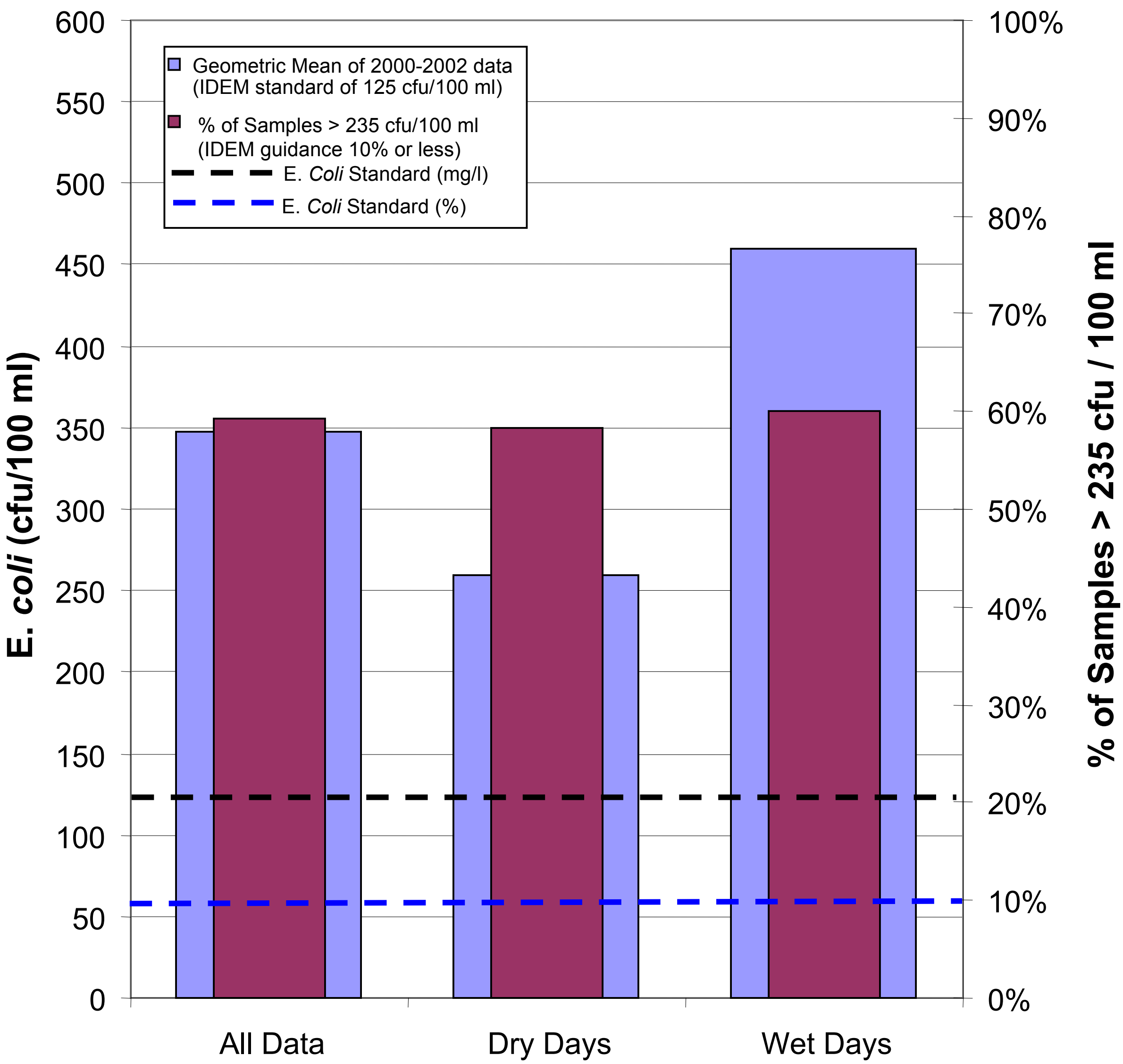
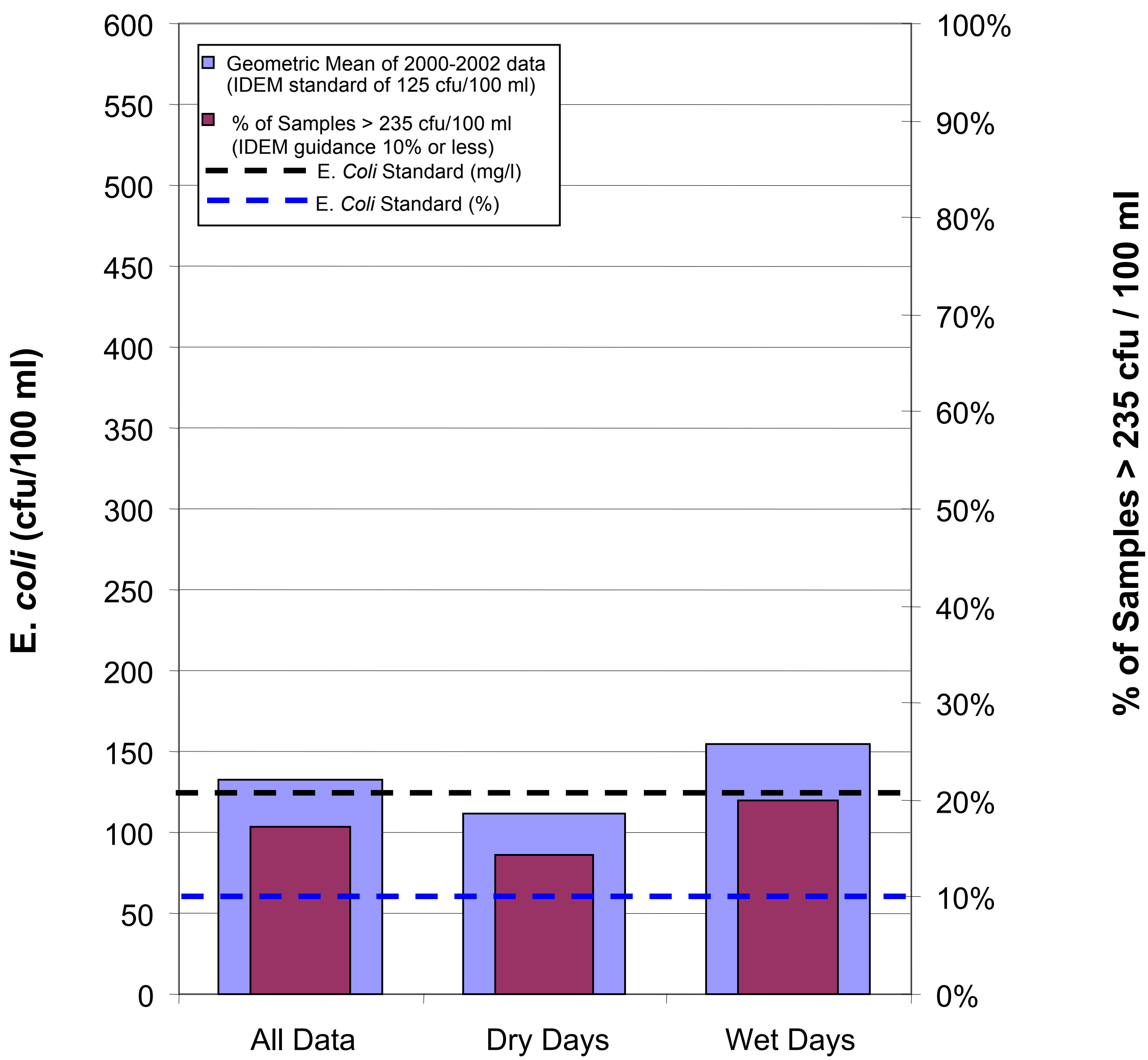


**Figure 4.6: *E. coli* Bacteria Compliance**
**Lawrence Creek**
**(Based on 2000 to 2002 Data)**
**City of Indianapolis**
**Stream Miles 0 to 2.4**



# Table 4.1: Segment Stream Miles - Fall Creek

| Stream Segment | Stream Mile Start | Stream Mile End |
|---|---|---|
| Fall Creek - Upstream of CSO Area | 6.7 | 16.2 |
| Fall Creek - Within CSO Area | 0 | 6.7 |
| Mud Creek - Tributary to Fall Creek | 0 | 6.6 |
| Devon Creek - Tributary to Fall Creek | 0 | 3.5 |
| Lawrence Creek - Tributary to Fall Creek | 0 | 2.4 |

# Table 4.2: *E. coli* Bacteria Compliance – Fall Creek

| River Segment | Geometric Mean of 2000-2002 data | % of Samples > 235 cfu/100 ml | Number of Samples > 10,000 cfu/100 ml | Total Number of Samples |
|---|---|---|---|---|
| **All Data** | | | | |
| Fall Creek - Upstream of CSO Area | 117 | 27.4% | 0 | 274 |
| Fall Creek - Within CSO Area | 295 | 50.1% | 30 | 902 |
| Mud Creek - Tributary to Fall Creek | 125 | 16.0% | 1 | 144 |
| Devon Creek - Tributary to Fall Creek | 347 | 59.2% | 0 | 49 |
| Lawrence Creek - Tributary to Fall Creek | 132 | 17.2% | 0 | 29 |
| **Dry Weather** | | | | |
| **River Segment** | **Geometric Mean of 2000-2002 data** | **% of Samples > 235 cfu/100 ml** | **Number of Samples > 10,000 cfu/100 ml** | **Total Number of Samples** |
| Fall Creek - Upstream of CSO Area | 72 | 11.4% | 0 | 132 |
| Fall Creek - Within CSO Area | 146 | 33.2% | 0 | 425 |
| Mud Creek - Tributary to Fall Creek | 89 | 6.8% | 0 | 73 |
| Devon Creek - Tributary to Fall Creek | 259 | 58.3% | 0 | 24 |
| Lawrence Creek - Tributary to Fall Creek | 112 | 14.3% | 0 | 14 |
| **Wet Weather** | | | | |
| **River Segment** | **Geometric Mean of 2000-2002 data** | **% of Samples > 235 cfu/100 ml** | **Number of Samples > 10,000 cfu/100 ml** | **Total Number of Samples** |
| Fall Creek - Upstream of CSO Area | 185 | 42.3% | 0 | 142 |
| Fall Creek - Within CSO Area | 552 | 65.2% | 30 | 477 |
| Mud Creek - Tributary to Fall Creek | 176 | 25.4% | 1 | 71 |
| Devon Creek - Tributary to Fall Creek | 460 | 60.0% | 0 | 25 |
| Lawrence Creek - Tributary to Fall Creek | 155 | 20.0% | 0 | 15 |
| **State Guidance [1]** | **(IDEM standard of 125 cfu/100 ml)** | **(IDEM Guidance 10% or less)** | **(IDEM Guidance None > 10,000 cfu/100 ml)** | |

[1] **Indiana's 303(d) Listing Methodology for Impaired Waterbodies and Total Maximum Daily Load - September 2002**

# Section 5
# Source Characterization

A source assessment is used to characterize the known and suspected sources of *E. coli* bacteria in the watershed for use in the water quality model and development of the TMDL. Using the watershed model (U.S. EPA SWMM), the *E. coli* bacteria were characterized for the following sources:

- Septic systems
- Illicit connections to storm drains
- Wildlife/Natural
- Stormwater runoff
- Combined sewer overflows

There are no NPDES wastewater treatment facilities on Fall Creek. All sources of *E. coli* bacteria identified in the two watersheds were assigned a loading rate based on data from the City of Indianapolis, literature values, and population in the watershed. Because of varying decay or die-off rates for *E. coli* bacteria, and varying transport assumptions, the *E. coli* bacteria loading from these sources were computed separately in the model as described below.

## 5.1 Septic Systems

Failing septic systems have been linked to increased *E. coli* bacteria levels in streams throughout the world. In accordance with the City of Indianapolis' Barrett Law program, a list of neighborhoods with failing septic systems is kept and updated based on new information. Scheduling of sewer projects in each neighborhood is partially based on the degree of system failure that is observed. Priority levels 1 through 3 are assigned with Priority 1 corresponding to neighborhoods with the highest degree of failure. The failure information was obtained for the period of 2000 through 2002 and was compared to sampling data for that same period. As of early 2000, there were 8 Priority 1 septic neighborhoods within the Fall Creek and Mud Creek watershed boundaries, as well as three Priority 2 and two Priority 3 septic neighborhoods. The number of septic systems in each watershed was estimated based on the city's GIS data for septic neighborhoods, buildings, and watersheds. *E. coli* bacteria loads were estimated based on an assumed failure rate, flow rate, and *E. coli* counts for the septic neighborhoods. For purposes of the TMDL analysis, the failure rate for septic systems was related to the priority level of the neighborhood as follows:

- Priority 1: 25% failure rate
- Priority 2: 15% failure rate
- Priority 3: 10% failure rate
- All others: 5% failure rate

A flow of 100 gallons/person-day and a concentration of 10,000 cfu/100 ml (Horsley and Whitten, 1996) for each failing septic system were assigned. Leaking septic systems are included in the water quality model as a point source having constant flow and concentration. The loading rate attributed to leaking septic systems is estimated to be 4.66 x $10^{10}$ cfu per day. **Table 5.1** summarizes the estimated septic *E. coli* loadings into Fall Creek.

## 5.2 Illicit Connections

Stormwater outfalls often carry *E. coli* during dry weather because of loadings from illicit sanitary connections to the stormwater collection system. The City of Indianapolis Fifth Annual Report (2002) (AMEC, 2003) reported that approximately 7.7% of the stormwater outfalls sampled contained dry weather flows. For each illicit discharge, a flow of 20 gpd with 10,000 cfu/100 ml for *E. coli* bacteria was assigned. **Table 5.2** summarizes the estimated illicit storm drain *E. coli* loadings into Fall Creek.

## 5.3 Wildlife and Natural Background

Not all *E. coli* in waterways is the result of man-made sources. Wildlife, both instream and on-bank, can be a source of *E. coli* bacteria to the streams. To estimate the potential load from wildlife, the instream monitoring station at 71st Street on Fall Creek was utilized. The land use above 71st Street indicates natural conditions with few anthropogenic sources. The *E. coli* bacteria monitoring data from this station was used to represent the wildlife or natural *E. coli* bacteria load into the streams**. Table 5.3** summarizes the estimated *E. coli* concentrations and loadings into Fall Creek that are a result of natural biota in the watersheds. All *E. coli* concentrations shown in the table received adjustment during model calibration.

## 5.4 Stormwater Runoff

Stormwater often carries *E. coli* because of loadings from domestic animals, wildlife, and agricultural land. Information from the City of Indianapolis' stormwater program and GIS coverages provided insight into the contribution of stormwater to the *E. coli* exceedance seen in Fall Creek and showed what progress has been made thus far in alleviating that contribution. Due to variations in solid deposits in residential, commercial, and other property types, a range of *E. coli* concentrations were assumed for each land use. Average stormwater *E. coli* counts were estimated from IMAGIS land use and watershed coverages. These counts were applied to daily surface runoff flows from October 1991 to October 2001 as predicted using the city's watershed model. **Table 5.4** contains a summary of the average daily surface runoff flows and *E. coli* loadings into Fall Creek based on land use. **Table 5.5** shows the percentages of stormwater loads into Fall Creek that come from permitted (storm drain outfall), non-permitted (surface runoff), and out-of-county sources. This information is pertinent to the TMDL analysis as the city's stormwater programs only address the control of stormwater *E. coli* from sources within the county.

## 5.5 Combined Sewer Overflows

Combined Sewer Overflows (CSOs) can be a large source of *E. coli* in urban streams. The CSO flows and *E. coli* bacteria loadings were determined using a methodology similar to that being used for the CSO Long Term Control Plan (LTCP). CSO discharges were predicted by the city's collection system model for a ten-year period of time (October 1991 to October 2001). *E. coli* sampling of CSO discharges were performed by the city in 2001 to characterize CSO discharges. Concentrations ranged from 500,000 cfu/100 ml up to 900,000 cfu/100 ml. The CSO flows and *E. coli* loads were predicted using the city's models and sampling data. **Table 5.6** contains a summary of the estimated *E. coli* loadings from CSOs into Fall Creek.

| TABLE 5.1: FAILING SEPTIC SYSTEMS<br>FALL CREEK | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Watershed | Approximate Count of Septic Systems | | | | Total Septic Systems | Estimated Failing Septic Systems | Approximate Population | Estimated Failing Septic Flow (MGD) | Estimated Failing Septic Daily Load (cfu) | Estimated Failing Septic Monthly Load (cfu) |
| | Barrett Law Priority 1 | Barrett Law Priority 2 | Barrett Law Priority 3 | Non-Barrett Law | | | | | | |
| **Assumed Failure Rate** | **25%** | **15%** | **10%** | **5%** | | | | | | |
| Mud Creek | 113 | 0 | 0 | 55 | 168 | 31 | 109 | 0.01 | 4.11E+09 | 1.23E+11 |
| Fall Creek Upstream | 899 | 465 | 179 | 165 | 1708 | 321 | 1122 | 0.11 | 4.25E+10 | 1.27E+12 |
| Fall Creek CSO | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.00 | 0.00E+00 | 0.00E+00 |
| **Fall Creek Totals** | **1012** | **465** | **179** | **220** | **1876** | **352** | **1231** | **0** | **4.66E+10** | **1.40E+12** |

*Assumptions include 3.5 persons per septic system, 100 gpcd septic flow, and 10,000 cfu/100 ml E. coli in the septic flow

**Persons per system and per capita flows taken from May 1989 DPW Design Standards

| TABLE 5.2: ILLICIT CONNECTIONS TO STORM DRAINS<br>FALL CREEK | | | | | | |
|---|---|---|---|---|---|---|
| Watershed | # of Storm Outfalls | Miles of Storm Sewer and Drains | Approximate number of Illicit Connections | Illicit Flow (MGD) | Estimated Illicit Connection Daily Load (cfu) | Estimated Illicit Connection Monthly Load (cfu) |
| Mud Creek | 58 | 65 | 4 | 8.00E-05 | 3.03E+07 | 9.08E+08 |
| Fall Creek Upstream | 151 | 244 | 12 | 2.40E-04 | 9.08E+07 | 2.73E+09 |
| Fall Creek CSO | 93 | 71 | 7 | 1.40E-04 | 5.30E+07 | 1.59E+09 |

*Illicit Connections for all watersheds assumed at 7.7% of outfalls (based on 2002 NPDES Stormwater report sampling data)
20 gpd sanitary flow, and 10,000 cfu/100 ml E. coli in the illicit flow

| TABLE 5.3: INSTREAM WILDLIFE<br>FALL CREEK | | | | |
|---|---|---|---|---|
| Watershed | Average Dry-Weather E. coli (cfu/100 ml) | Average Dry-Weather stream flow (cfs) | Approximate Instream Wildlife Daily Load (cfu) | Estimated Instream Wildlife Monthly Load (cfu) |
| Mud Creek* | 20 | 5 | 2.45E+09 | 7.34E+10 |
| Fall Creek Upstream* | 33 | 20 | 1.61E+10 | 4.84E+11 |
| Fall Creek CSO* | 34 | 70 | 5.81E+10 | 1.74E+12 |

*The 71st Street Sampling Station along Fall Creek is not in close proximity to any septic systems. Its dry-weather observed E. coli bacteria concentrations are assumed to be the result of wildlife. This concentration is applied to all other streams

*These concentrations received adjustment during model calibration. Calibrated concentrations are shown.

| TABLE 5.4: STORMWATER RUNOFF FROM SEPARATE SEWER AREAS<br>FALL CREEK | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Approximate Percentage of Specified Land use | | | | | | | | Approximate Average E. Coli Concentration (cfu/100 ml) | Daily Average Stormwater Flow (cfs) | Daily Average Stormwater Load (cfu) |
| Land use Type | Commercial | Residential | Historic & Hospital | Industrial | Parks | Highway ROW | Spec. Uses | University | | | |
| Zoning Class | All C's | All D's | All H's | All I's | All PK's | ROW, RC | All SU's | All U's | | | |
| Assumed E. coli concentration | 2500 | 2000 | 2500 | 5000 | 2000 | 5000 | 3000 | 3000 | | | |
| Mud Creek | Assumed to be the same as Fall Creek | | | | | | | | 2300 | 3 | 1.79E+11 |
| Fall Creek Upstream | 3% | 71% | 0% | 2% | 4% | 1% | 19% | 0% | 2300 | 22 | 1.24E+12 |
| Fall Creek CSO | 9% | 65% | 1% | 9% | 4% | 2% | 9% | 1% | 2300 | 6 | 3.40E+11 |

| TABLE 5.5: UNPERMITTED AND PERMITTED STORMWATER RUNOFF SOURCES<br>FALL CREEK | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Watershed** | **Permitted Storm Sewer Area (Acres)** | **Area without Storm Sewers (Acres)** | **Area outside County (Acres)** | **Total Area (Acres)** | **% Permitted** | **% Unpermitted** | **% Out of County** |
| Fall Creek Upstream* | 26,000 | - | 33,000 | 59,000 | 45% | 0% | 55% |

*Includes Mud Creek and Indian Creek

| TABLE 5.6: COMBINED SEWER OVERFLOWS<br>FALL CREEK | | | | | | | |
|---|---|---|---|---|---|---|---|
| Watershed | # Of CSO Regulators | # of CSO Outfalls | Annual Average CSO Volume (MG) | Average CSO E. Coli Concentration (cfu/100 ml) | Annual Average CSO E. Coli Load (cfu) | Daily Average CSO E. Coli Load (cfu) | Monthly Average CSO E. Coli Load (cfu) |
| Fall Creek CSO | 35 | 26 | 1713 | 9.33E+05 | 4.02E+16 | 1.10E+14 | 3.30E+15 |

*Flows and bacteria loadings are from the 50-year rainfall record. Flows and loads presented are model results.

# Section 6
# Total Maximum Daily Load Analysis

A TMDL is a tool for meeting water quality standards. It is based on the relationship between sources of pollutants and instream water quality conditions. The TMDL establishes the allowable loadings for specific pollutants that a water body can receive without exceeding water quality standards, thereby providing the basis for establishing water quality based pollutant controls.

## 6.1 Goals

Using the U.S. EPA *Protocol for Developing Pathogen TMDLs* (January 2001), the following steps were followed and utilized to develop a TMDL for *E. coli*:

- **Problem identification**: Identify key factors and background information for waterbody that describe the nature of the impairment.
- **Water quality indicators and targets**: Identify numeric indicators and target values that can be used to evaluate attainment of water quality standards.
- **Source assessment**: Identify and characterize sources of pollutant to water body.
- **Linkage between water quality targets and sources**: Linkage establishes the cause and effect relationship between the pollutant sources and the instream water quality response. The linkage is further used to estimate the load assimilation capacity of the water body, which is the maximum amount of pollutant loading a water body can assimilate and still attain water quality standards.
- **Load allocation**: Based on the established target/sources linkage, pollutant loadings that will not exceed the load assimilation capacity and will lead to attainment of the water quality standard can be determined.
- **Assembling the TMDL**: The elements of a TMDL submittal are compiled to facilitate TMDL review.

The final step in the TMDL process will occur in the near future.

- **Follow-up monitoring and evaluation**: After implementation of the TMDL, follow-up monitoring is used to assess if the TMDL results in attaining water quality standards for the water body.

## 6.2 Methods

A watershed model of Fall Creek was developed and validated to the existing instream *E. coli* bacteria data. The model simulated the daily instream bacteria counts for each stream segment based on loads from the sources described in Section 5. For the dry weather sources, a constant load was applied, whereas for stormwater runoff and CSO discharges, the *E. coli* bacteria load was based on the city's separate sewer area water quality model for stormwater, and the collection system interceptor hydraulic model for CSO discharges during wet weather. A ten-year period of time (October 1991 through September 2001) was simulated. Data on stream flow was used to predict the resultant instream *E. coli* bacteria counts for each day for the ten-year period.

Daily flow data for the Fall Creek – Millersville station was obtained from the USGS for the period of October 1, 1991 through September 30, 2001. This flow data was used for the daily *E. coli* bacteria model.

**Table 6.1** presents a sample page from the daily *E. coli* bacteria model for the Fall Creek – CSO area. **Figure 6.1** presents the predicted instream bacteria counts for April 1, 1997 to October 31, 1997, the most representative sampling period.

Model calibration consisted of comparisons of the geometric mean, percent of samples over 235 cfu/100 ml, and the number of samples over 10,000 cfu/100 ml per year of sampling. These comparisons were performed for both dry weather and wet weather data. The calibration of the mass balance model for *E. coli* bacteria included quality checks of the USGS daily flow data, adjustment for *E. coli* contributions from wildlife for all reaches, and for *E. coli* contributions from stormwater. **Table 6.2** contains a summary of the observed and modeled *E. coli* bacteria loading parameters for the two watersheds modeled from October 1991 through September 2001. The percentage of observed and predicted days in excess of 235 cfu/100 ml for dry, wet, and all weather conditions is reported in the table. **Table 6.3** summarizes the daily septic, illicit connections, wildlife, stormwater, and CSO *E. coli* bacteria loadings into Fall Creek and Mud Creek.

## 6.3 Load Allocation

After establishing the pollutant sources and the relationship between pollutant sources and instream water quality, a load allocation (reduction) was developed to achieve the numeric target value for each parameter. However, there are numerous combinations of load reduction scenarios that all achieve the target value. The method for load allocation is very important and can require significant work with stakeholders and other interested parties. To address this issue, a series of load allocation scenarios were simulated and presented. Based on the discussion and direction from IDEM, the scenarios were modified and a final set of scenarios was simulated.

The allowable TMDLs for Fall Creek are presented below.

- Fall Creek upstream of the CSO area -- **2.32 x $10^{11}$ cfu**, which would require an 84% reduction in the average daily bacteria load.

- Fall Creek within the CSO area -- **2.42x $10^{11}$ cfu**, which would require a 99.8% reduction in the average daily bacteria load.

Two scenarios were evaluated:

1. A representative load reduction scenario was evaluated using the daily *E. coli* bacteria model. This scenario is representative of the current and future watershed programs being pursued by the City of Indianapolis. This program consists of removing illicit sanitary connections, converting failing septic systems to sanitary sewers in the Barrett Law Program, reducing stormwater loadings per the NPDES Permit Program, and controlling CSOs per the Final CSO LTCP[1]. The city's current stormwater NPDES Permit program is assumed to reduce the stormwater *E. coli* bacteria load by approximately 10 percent. This reduction is considered to be an estimate of the program's effectiveness, not an objective.

2. An additional scenario was also evaluated to identify the water quality impacts of flow augmentation in the Fall Creek CSO Area. This scenario consists of the programs summarized above, coupled with 15 MGD of additional daily disinfected flow into the Fall Creek CSO Area.

## 6.4 Findings of Simulated Scenarios

**Table 6.4** contains a summary of the performance of controls in the Fall Creek scenarios compared with the TMDL criteria of 125 cfu/100 ml for monthly geometric mean, percent of days with *E. coli* bacteria levels above 235 cfu/100 ml, and number of days per year with *E. coli* bacteria levels above 10,000 cfu/100 ml. The model results show that all three criteria can be met under dry weather flow conditions by the removal of failing septic systems and illicit sanitary connections. The findings also show that significant reductions in wet weather *E. coli* bacteria can be achieved by stormwater and CSO controls. **Figures 6.2 and 6.3** contain plots of the TMDL targets for all Fall Creek scenarios.

Additional controls beyond the scenarios presented may be necessary to achieve the TMDL. **Table 6.4** also contains the additional load reduction required to meet the TMDL. Flow augmentation in the Fall Creek CSO area would increase its **allowable TMDL** to **$2.60 \times 10^{11}$ cfu**, which would still require a 99.8% reduction in the average daily bacteria load.

## 6.5 Margin of Safety

The Margin of Safety (MOS) is a required component of TMDL development. There are two basic methods for incorporating the MOS: 1) Implicitly incorporate the MOS using conservative model assumptions to develop allocations; or 2) Explicitly specify a portion of the TMDL as the MOS and use the remainder for allocations. For this TMDL the MOS was implicitly incorporated into the modeling process by selecting a

[1] The modeled load reduction was the recommended plan in the April 2001 Draft CSO LTCP. The recommended level of CSO control was 85% capture, or 12 overflow events per year. The final CSO LTCP is in development.

critical time period and critical default values for each of the summer and winter seasons based on the results of a 10-year simulation.

**Figure 6.1: Predicted Fall Creek CSO Area Daily *E. coli* Bacteria Counts**

**April 1, 1997 through October 31, 1997**

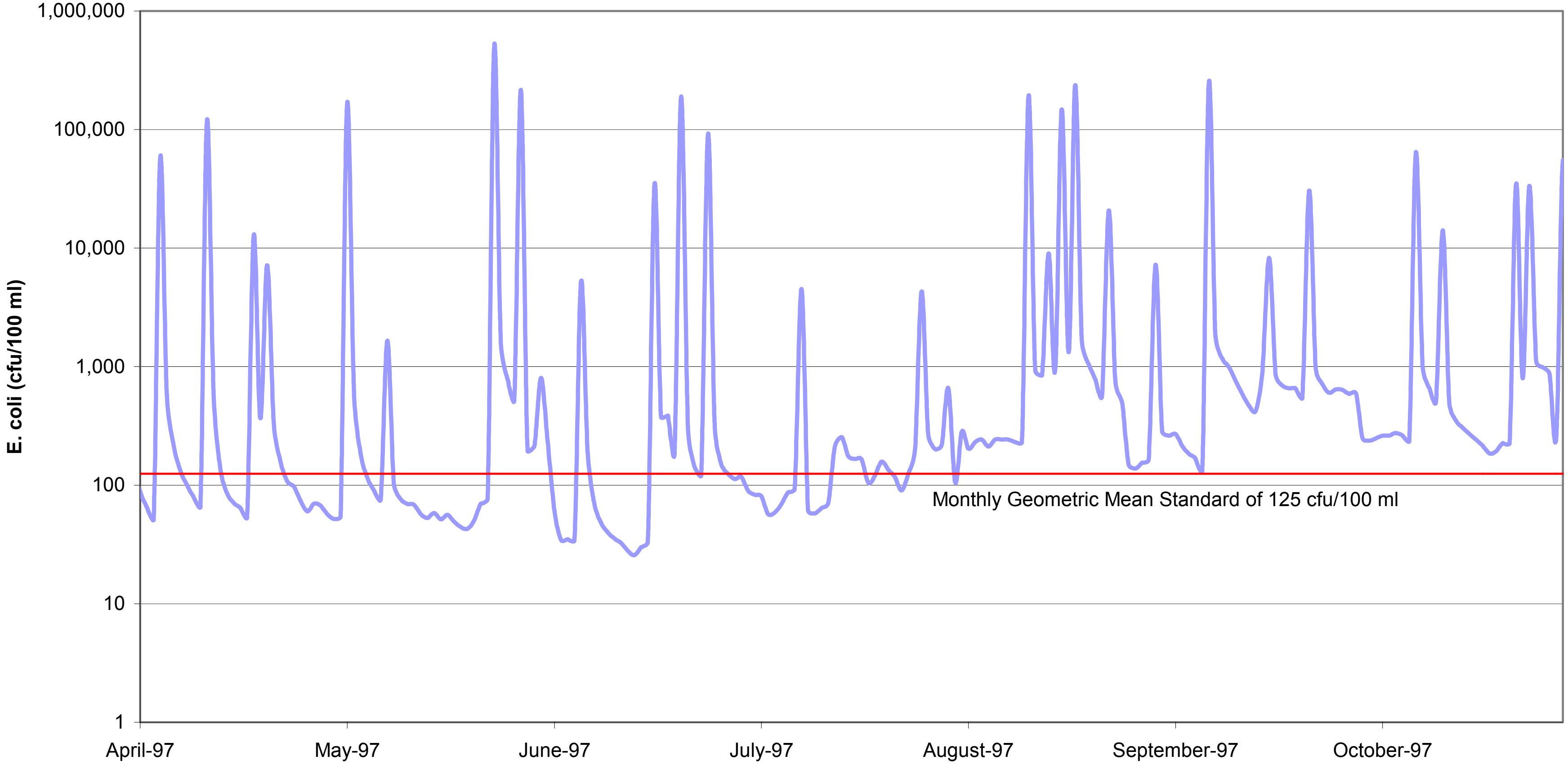


**Figure 6.2: Fall Creek Upstream of CSO Area -- *E. coli* Bacteria Geometric Mean**
**% of Days E. coli Bacteria > 235 cfu/100 ml**
**# of Days per year E. coli Bacteria > 10,000 cfu/100 ml**

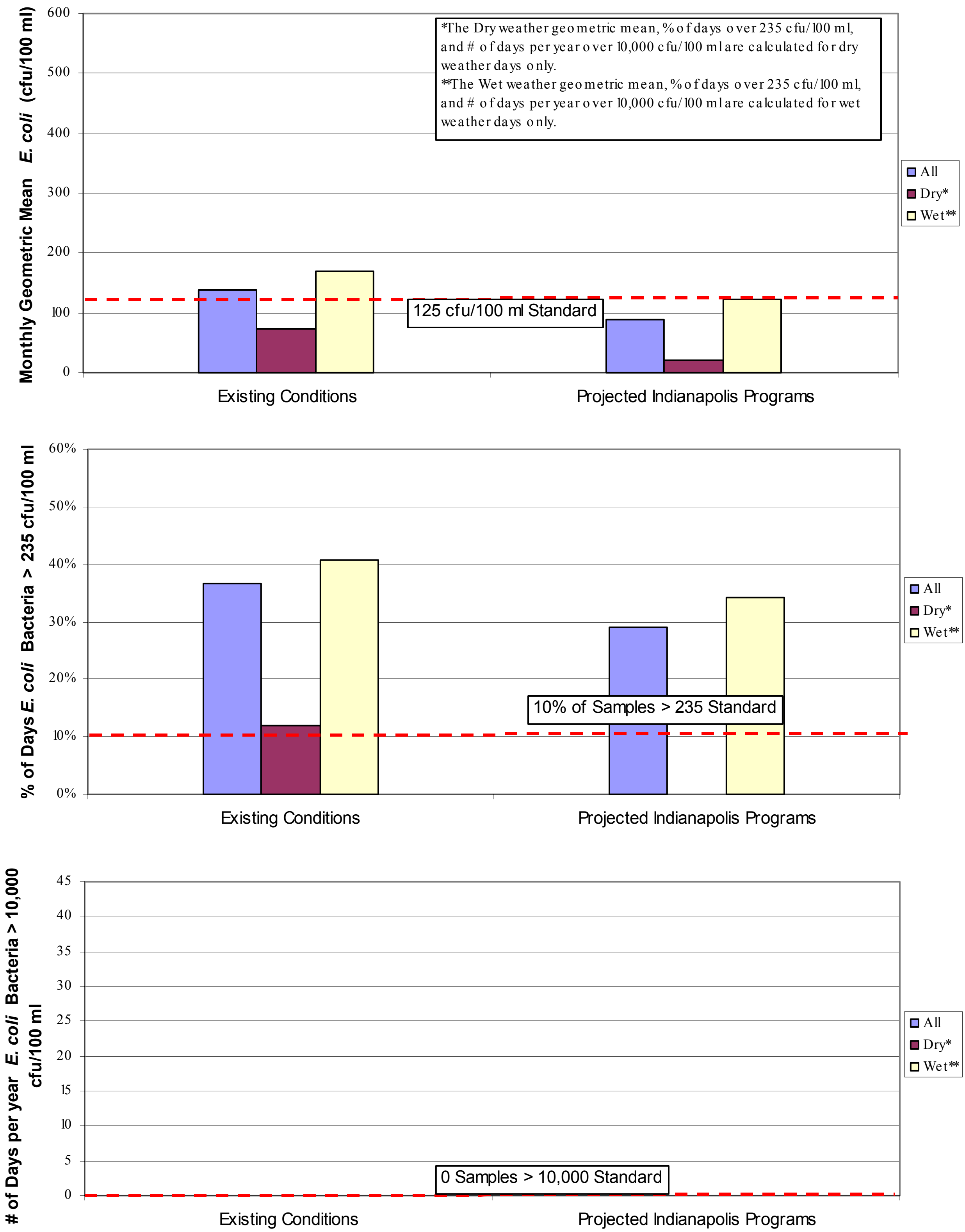


**Figure 6.3: Fall Creek within CSO Area -- E. coli Bacteria Geometric Mean**
**% of Days E. coli Bacteria > 235 cfu/100 ml**
**# of Days per year E. coli Bacteria > 10,000 cfu/100 ml**

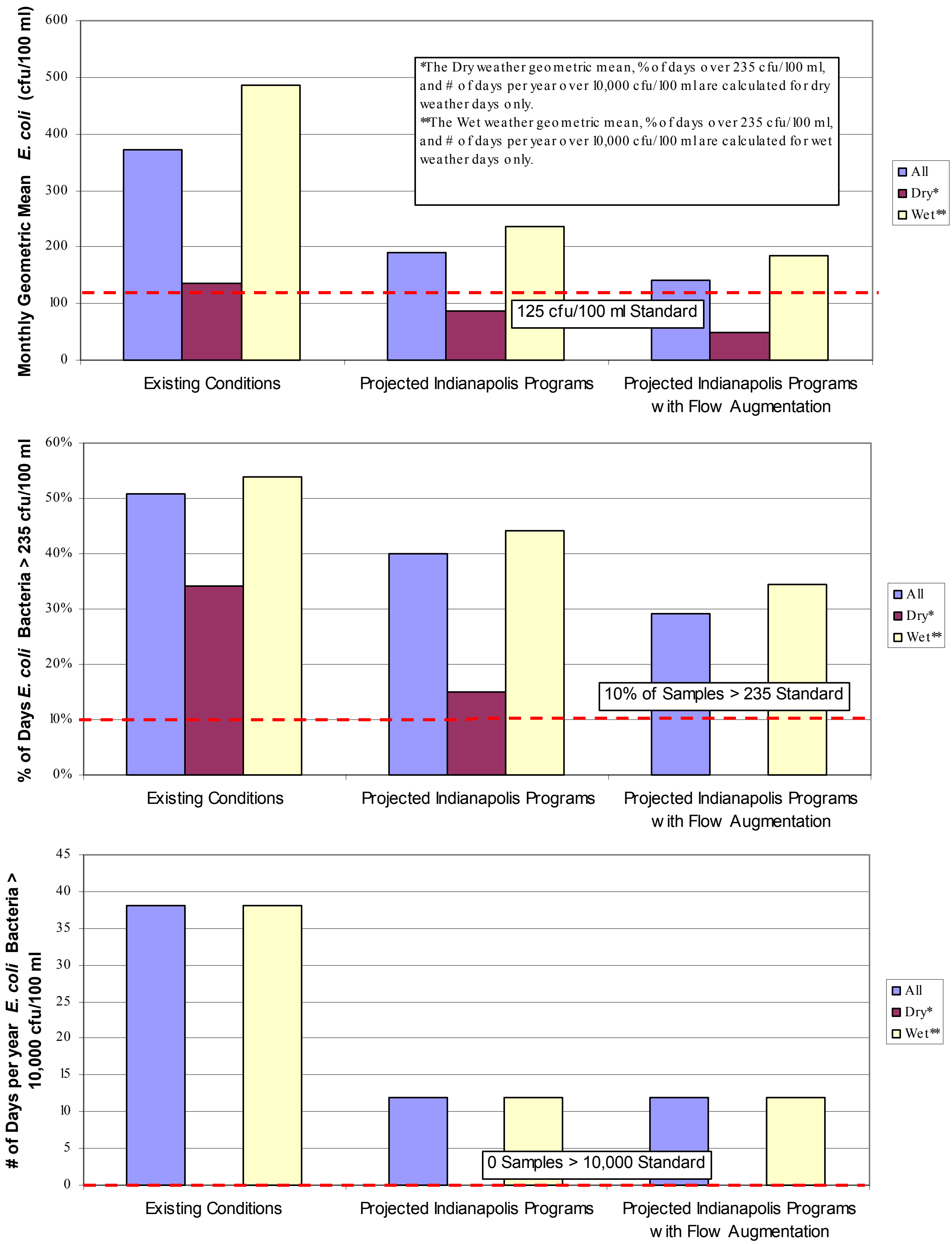


TABLE 6.1: SAMPLE OF FALL CREEK CSO AREA DAILY *E. coli* COUNTS

| Date | Average Daily Flow (cfs) | Water Company Withdrawl (cfs) | Stormwater Runoff (cfs) | CSO Flow (cfs) | Corrected Average Daily Flow (cfs) | Septic Load (cfu/day) | Illicit Load (cfu/day) | Wildlife Load (cfu/day) | Stormwater Load (cfu/day) | CSO Load (cfu/day) | Total Load (cfu/day) | Resulting Concentration (cfu/100 ml) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10/1/1991 | 54 | 24 | 0 | 0 | 30 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 0.00E+00 | 0.00E+00 | 1.24E+11 | 167 |
| 10/2/1991 | 58 | 24 | 0 | 0 | 34 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 0.00E+00 | 0.00E+00 | 1.24E+11 | 148 |
| 10/3/1991 | 68 | 24 | 23 | 2 | 69 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 1.27E+12 | 3.84E+13 | 3.98E+13 | 23,649 |
| 10/4/1991 | 57 | 24 | 6 | 0 | 40 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 3.57E+11 | 0.00E+00 | 4.81E+11 | 494 |
| 10/5/1991 | 75 | 24 | 121 | 30 | 203 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 6.81E+12 | 6.84E+14 | 6.91E+14 | 139,433 |
| 10/6/1991 | 68 | 24 | 32 | 0 | 77 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 1.80E+12 | 0.00E+00 | 1.93E+12 | 1,030 |
| 10/7/1991 | 58 | 24 | 16 | 0 | 51 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 9.03E+11 | 0.00E+00 | 1.03E+12 | 832 |
| 10/8/1991 | 56 | 24 | 9 | 0 | 42 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 5.12E+11 | 0.00E+00 | 6.36E+11 | 626 |
| 10/9/1991 | 55 | 24 | 5 | 0 | 37 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 3.06E+11 | 0.00E+00 | 4.30E+11 | 477 |
| 10/10/1991 | 58 | 24 | 15 | 1 | 50 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 8.41E+11 | 1.47E+13 | 1.57E+13 | 12,791 |
| 10/11/1991 | 58 | 24 | 7 | 0 | 41 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 3.83E+11 | 0.00E+00 | 5.08E+11 | 503 |
| 10/12/1991 | 57 | 24 | 4 | 0 | 37 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 2.19E+11 | 0.00E+00 | 3.43E+11 | 376 |
| 10/13/1991 | 56 | 24 | 2 | 0 | 35 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 1.36E+11 | 0.00E+00 | 2.60E+11 | 305 |
| 10/14/1991 | 57 | 24 | 7 | 0 | 41 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 3.83E+11 | 5.72E+12 | 6.23E+12 | 6,286 |
| 10/15/1991 | 56 | 24 | 5 | 0 | 37 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 2.54E+11 | 0.00E+00 | 3.78E+11 | 418 |
| 10/16/1991 | 57 | 24 | 2 | 0 | 36 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 1.31E+11 | 0.00E+00 | 2.55E+11 | 292 |
| 10/17/1991 | 56 | 24 | 1 | 0 | 34 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 7.71E+10 | 0.00E+00 | 2.01E+11 | 243 |
| 10/18/1991 | 55 | 24 | 1 | 0 | 32 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 4.54E+10 | 0.00E+00 | 1.70E+11 | 215 |
| 10/19/1991 | 56 | 24 | 2 | 0 | 34 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 1.05E+11 | 0.00E+00 | 2.29E+11 | 273 |
| 10/20/1991 | 56 | 24 | 1 | 0 | 33 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 5.23E+10 | 0.00E+00 | 1.77E+11 | 216 |
| 10/21/1991 | 56 | 24 | 0 | 0 | 33 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 2.41E+10 | 0.00E+00 | 1.48E+11 | 185 |
| 10/22/1991 | 54 | 24 | 0 | 0 | 31 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 9.62E+09 | 0.00E+00 | 1.34E+11 | 179 |
| 10/23/1991 | 55 | 24 | 0 | 0 | 32 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 2.74E+09 | 0.00E+00 | 1.27E+11 | 165 |
| 10/24/1991 | 58 | 24 | 0 | 317 | 352 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 2.96E+09 | 7.25E+15 | 7.25E+15 | 841,649 |
| 10/25/1991 | 67 | 24 | 143 | 0 | 186 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 8.03E+12 | 0.00E+00 | 8.16E+12 | 1,791 |
| 10/26/1991 | 368 | 24 | 873 | 0 | 1217 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 4.91E+13 | 0.00E+00 | 4.92E+13 | 1,653 |
| 10/27/1991 | 299 | 24 | 330 | 0 | 605 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 1.85E+13 | 0.00E+00 | 1.87E+13 | 1,261 |
| 10/28/1991 | 121 | 24 | 77 | 0 | 174 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 4.31E+12 | 0.00E+00 | 4.44E+12 | 1,042 |
| 10/29/1991 | 77 | 24 | 31 | 0 | 84 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 1.74E+12 | 0.00E+00 | 1.87E+12 | 905 |
| 10/30/1991 | 64 | 24 | 15 | 1 | 57 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 8.58E+11 | 3.16E+13 | 3.26E+13 | 23,362 |
| 10/31/1991 | 57 | 24 | 9 | 0 | 42 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 4.79E+11 | 0.00E+00 | 6.03E+11 | 588 |
| 11/1/1991 | 66 | 30 | 18 | 0 | 55 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 1.02E+12 | 0.00E+00 | 1.15E+12 | 858 |
| 11/2/1991 | 64 | 30 | 12 | 0 | 46 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 6.70E+11 | 0.00E+00 | 7.95E+11 | 701 |
| 11/3/1991 | 55 | 30 | 6 | 0 | 32 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 3.45E+11 | 0.00E+00 | 4.69E+11 | 607 |
| 11/4/1991 | 51 | 30 | 4 | 0 | 26 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 2.34E+11 | 0.00E+00 | 3.58E+11 | 572 |
| 11/5/1991 | 49 | 30 | 3 | 0 | 22 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 1.50E+11 | 0.00E+00 | 2.74E+11 | 507 |
| 11/6/1991 | 46 | 30 | 2 | 0 | 18 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 9.33E+10 | 0.00E+00 | 2.18E+11 | 492 |
| 11/7/1991 | 46 | 30 | 3 | 0 | 19 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 1.50E+11 | 0.00E+00 | 2.74E+11 | 587 |
| 11/8/1991 | 44 | 30 | 2 | 0 | 16 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 9.09E+10 | 0.00E+00 | 2.15E+11 | 548 |
| 11/9/1991 | 44 | 30 | 1 | 0 | 15 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 4.76E+10 | 0.00E+00 | 1.72E+11 | 460 |
| 11/10/1991 | 44 | 30 | 0 | 0 | 15 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 2.46E+10 | 0.00E+00 | 1.49E+11 | 409 |
| 11/11/1991 | 43 | 30 | 0 | 0 | 14 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 1.15E+10 | 0.00E+00 | 1.36E+11 | 407 |
| 11/12/1991 | 43 | 30 | 3 | 0 | 16 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 1.46E+11 | 9.89E+11 | 1.26E+12 | 3,201 |
| 11/13/1991 | 43 | 30 | 2 | 0 | 15 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 9.67E+10 | 0.00E+00 | 2.21E+11 | 596 |
| 11/14/1991 | 43 | 30 | 1 | 0 | 14 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 3.98E+10 | 0.00E+00 | 1.64E+11 | 474 |
| 11/15/1991 | 43 | 30 | 2 | 0 | 15 | 4.66E+10 | 1.74E+08 | 7.76E+10 | 9.23E+10 | 0.00E+00 | 2.17E+11 | 587 |

| TABLE 6.2: COMPARISON OF OBSERVED AND MODELED E. COLI COUNTS<br>FALL CREEK | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Geometric Mean | | | % of Days > 235 | | | # of Samples > 10000 per Year | | |
| Watershed | All | Dry** | Wet*** | All | Dry** | Wet*** | All | Dry** | Wet*** |
| Fall Creek-Upstream Measured* | 117 | 72 | 185 | 27% | 11% | 42% | 0 | 0 | 0 |
| Fall Creek-Upstream Modeled | 139 | 72 | 169 | 37% | 12% | 41% | 0 | 0 | 0 |
| | | | | | | | | | |
| Fall Creek-CSO Measured* | 295 | 146 | 552 | 50% | 33% | 65% | 20 | 0 | 20 |
| Fall Creek-CSO Modeled | 372 | 138 | 487 | 51% | 34% | 54% | 38 | 0 | 38 |

*Measured *E. coli* counts are reported in Table 4.2

**The Dry weather geometric mean, % of days over 235 cfu/100 ml, and # of days per year over 10,000 cfu/100 ml are calculated for dry weather days only

***The Wet weather geometric mean, % of days over 235 cfu/100 ml, and # of days per year over 10,000 cfu/100 ml are calculated for wet weather days only

| TABLE 6.3: TOTAL AVERAGE E. COLI DAILY LOAD<br>FALL CREEK | | | | | | | |
|---|---|---|---|---|---|---|---|
| Watershed | Average Daily Septic Load (cfu) | Average Daily Illicit Connection Load (cfu) | Average Daily Wildlife Load (cfu) | Average Daily Stormwater Load (cfu) | Average Daily CSO Load (cfu) | Total Average Daily Load (cfu) | Total Cumulative Daily Load (cfu) |
| Mud Creek | 4.11E+09 | 3.03E+07 | 2.45E+09 | 1.79E+11 | 0.00E+00 | 1.85E+11 | |
| Fall Creek Upstream | 4.25E+10 | 9.08E+07 | 1.61E+10 | 1.24E+12 | 0.00E+00 | 1.30E+12 | 1.48E+12 |
| Fall Creek CSO | 0.00E+00 | 5.30E+07 | 5.81E+10 | 3.40E+11 | 1.10E+14 | 1.11E+14 | **1.12E+14** |

| TABLE 6.4: EFFECTS OF WATERSHED IMPROVEMENT SCENARIOS<br>FALL CREEK | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Geometric Mean of *E. coli* bacteria | | | % of Days *E. coli* bacteria > 235 cfu/100 ml | | | # of Days per year *E. coli* bacteria > 10,000 cfu/100 ml | | | Additional Load Reduction Required to meet the allowable TMDL (cfu)*** |
| Scenario | All | Dry* | Wet** | All | Dry* | Wet** | All | Dry* | Wet** | |
| **TMDL Objectives** | **125** | | | **10%** | | | **0** | | | |
| Fall Creek-Upstream Existing | 139 | **72** | 169 | 37% | 12% | 41% | **0** | **0** | **0** | 1.25E+12 |
| Fall Creek-Upstream Projected Indianapolis Programs | **89** | **22** | **123** | 29% | **0%** | 34% | **0** | **0** | **0** | 1.06E+12 |
| | | | | | | | | | | |
| Fall Creek-CSO Existing | 372 | 137 | 486 | 51% | 34% | 54% | 38 | **0** | 38 | 1.12E+14 |
| Fall Creek-CSO Projected Indianapolis Programs | 190 | **86** | 237 | 40% | 15% | 44% | 12 | **0** | 12 | 4.05E+13 |
| Fall Creek-CSO Projected Indianapolis Programs with Flow Augmentation | 141 | **48** | 184 | 29% | **0%** | 34% | 12 | **0** | 12 | 4.05E+13 |

Note: *E. coli* counts below the TMDL Objective are in bold

*The Dry weather geometric mean, % of days over 235 cfu/100 ml, and # of days per year over 10,000 cfu/100 ml are calculated for dry weather days only

**The Wet weather geometric mean, % of days over 235 cfu/100 ml, and # of days per year over 10,000 cfu/100 ml are calculated for wet weather days only

***The TMDL for Fall Creek upstream of the CSO area is 2.32x10^11 cfu
The TMDL for the Fall Creek CSO area is 2.42x10^11 cfu
The TMDL for the Fall Creek CSO area with Flow Augmentation, is 2.60x10^11 cfu

# Section 7
# Public Participation

To date, the IDEM has held three public stakeholder meetings to present the progress of the TMDL program for Fall Creek. Information such as a summary of findings, characterization of the river, weather conditions and how results are affected, model introduction, and an overview of the TMDL process were presented. The public participation meetings were held on September 17, 2002; December 17, 2002; and April 1, 2003. Future meetings are planned in order to present the findings of this report to community stakeholders.

IDEM invited all registered neighborhood organizations in Indianapolis, as well as all major environmental groups. Environmental groups in attendance at the public stakeholder meetings include the Wet Weather Technical Advisory Committee and the Friends of the White River.

In addition to the TMDL process, water quality-related public outreach is a key component of the city's CSO LTCP and stormwater programs.

# Section 8
# Implementation Activities and Schedule

There are no specific activities planned as a result of this TMDL study, but this TMDL study has been incorporated into the existing programs for control of stormwater, septic systems, and CSOs. The TMDL process is incorporated into all of these programs, which are briefly described below.

## 8.1 Stormwater Program

The city utilizes new construction or redevelopment permitting as an opportunity to control stormwater flows that discharge into receiving streams or the CSO system through the recently revised Chapter 700 to Section 581 of the City of Indianapolis Code (Stormwater Management and Sediment Control). Chapter 700 requires best management practices (BMPs) to improve the quality of the stormwater runoff whenever new construction or redevelopment that disturbs more than 1/2 - acre is proposed anywhere in Marion County. The city is implementing this proactive approach in the CSO area to improve water quality even though it is not required by the NPDES stormwater permit. The city requires that prior to new construction, reconstruction, or remodeling, contractors and developers must submit a stormwater control plan and obtain drainage permits to address stormwater runoff originating from the sites. In the CSO area, controlling stormwater runoff has the added benefit of potentially reducing CSO discharges to the receiving streams. In addition, at locations where the stormwater runoff is controlled and then treated by BMPs before being discharged directly to the receiving streams, the city stormwater programs require developers to improve the urban stormwater quality.

Control of stormwater runoff quality is based on the management of total suspended solids (TSS). The target TSS removal rate is 80%. The requirements apply to all areas of the county except the city limits of Beech Grove, Lawrence, Southport and Speedway. Control of sediment is required for construction site runoff citywide.

The city's current stormwater NPDES Permit program is assumed to reduce the stormwater *E. coli* bacteria load by approximately 10 percent. This reduction is considered to be an estimate of the program's effectiveness, not an objective.

## 8.2 Barrett Law Septic Program

Of the 320,000 homes in Marion County, approximately 18,000 are served by septic systems that were targeted for replacement in the 1998 Barrett Law Master Plan. The Barrett Law Master Plan prioritized 161 unsewered areas for conversion to sewers. The master plan ranks each area based on the following criteria: septic failure rate, stream bacteriological impairment, wellfield protection, presence of residential wells, proximity to greenways, petitions from residents or Marion County Health & Hospital Corp., number of residents in favor of the project, cost, and downstream capacity. These areas are then placed into one of four categories: Priority 1, Priority 2, Priority 3, and other septic areas not immediately projected for conversion to sewers.

## 8.3 CSO Long Term Control Plan

In 2001, the City of Indianapolis submitted a CSO Long Term Control Plan for review to IDEM and the USEPA. This plan proposed an 85% level of capture to achieve water quality standards within the streams of Indianapolis given financial constraints. The plan consisted of AWT enhancements, various system control alternatives, streambank restoration and sediment removal, and accelerated septic system removal.

Negotiations with IDEM and Region V EPA are ongoing and may affect the final level of capture and pollutant removal rates achieved through the LTCP. A final CSO LTCP is expected in spring 2004. The TMDL analysis is expected to reflect the final LTCP.

# Section 9
# Monitoring Plan

An integral part of managing the progress of a TMDL program is monitoring. The current monitoring programs performed by the City of Indianapolis Office of Environmental Services and the Marion County Health Department will continue throughout the implementation of load allocations. These monitoring programs consist of sampling at the locations and intervals described in Section 3 of this report.

As the city's watershed improvement programs are implemented, this continued monitoring will allow the city and IDEM the opportunity to review progress towards meeting water quality standards.

In accordance with EPA's guidance, IDEM and the city reserve the right to revise the projected programs if necessary.

# References

AMEC. 2003. *City of Indianapolis Fifth Annual Report (2002)*

Camp Dresser & McKee (CDM). 2003. *CSO Control Technologies Evaluation.*

Camp Dresser & McKee (CDM). 2003. *Fall Creek TMDL Report.*

U.S. Environmental Protection Agency (EPA). 2001. *Protocol for Developing Pathogen TMDLs*

# FALL CREEK TMDL REPORT

# APPENDICES

| Date | OES Sampling Locations | | | | | | |
|---|---|---|---|---|---|---|---|
| | Wet or Dry? | 16th Street | | 71st Street | | 79th Street | |
| | | E. Coli (col/100 mL) | % Compliance | E. Coli (col/100 mL) | % Compliance | E. Coli (col/100 mL) | % Compliance |
| 01/06/00 | Dry | 27 | 1 | 18 | 1 | | |
| 02/03/00 | Wet | 9 | 1 | 40 | 1 | | |
| 03/02/00 | Wet | 500 | 0 | 18 | 1 | | |
| 04/06/00 | Dry | 1100 | 0 | 28 | 1 | | |
| 05/04/00 | Wet | 800 | 0 | **2** | 1 | | |
| 06/08/00 | Dry | 300 | 0 | 124 | 1 | | |
| 07/06/00 | Wet | 12000 | 0 | 60 | 1 | | |
| 08/10/00 | Wet | 1639 | 0 | 540 | 0 | | |
| 09/07/00 | Dry | 4000 | 0 | 280 | 0 | | |
| 10/05/00 | Wet | **200000** | 0 | 6800 | 0 | | |
| 11/03/00 | Dry | 280 | 0 | 27 | 1 | | |
| 12/07/00 | Dry | 59 | 1 | 84 | 1 | | |
| 01/16/01 | Dry | 800 | 0 | **3** | 1 | | |
| 02/13/01 | Dry | 80 | 1 | 50 | 1 | | |
| 03/07/01 | Dry | 500 | 0 | 10 | 1 | | |
| 04/05/01 | Dry | 16 | 1 | 40 | 1 | | |
| 05/03/01 | Dry | 100 | 1 | 62 | 1 | | |
| 06/14/01 | Dry | 2900 | 0 | 32 | 1 | | |
| 07/12/01 | Dry | 320 | 0 | 88 | 1 | | |
| 08/09/01 | Dry | 120 | 1 | 84 | 1 | | |
| 09/06/01 | Dry | 160 | 1 | 50 | 1 | | |
| 10/04/01 | Dry | 151 | 1 | 24 | 1 | | |
| 11/08/01 | Dry | 27 | 1 | 8 | 1 | | |
| 12/05/01 | Dry | 84 | 1 | 8 | 1 | | |
| 05/01/02 | Dry | 32 | 1 | **10** | 1 | **10** | 1 |
| 05/07/02 | Wet | 2400 | 0 | 120 | 1 | 53 | 1 |
| 05/14/02 | Wet | 540 | 0 | 187 | 1 | 120 | 1 |
| 05/21/02 | Wet | 72 | 1 | 5 | 1 | **4** | 1 |
| 05/28/02 | Wet | 1300 | 0 | 27 | 1 | **20** | 1 |
| 06/03/02 | Wet | 133 | 1 | **20** | 1 | **20** | 1 |
| 06/10/02 | Dry | 67 | 1 | **20** | 1 | **20** | 1 |
| 06/12/02 | Wet | 2250 | 0 | 27 | 1 | **20** | 1 |
| 06/17/02 | Wet | 273 | 0 | **10** | 1 | 12 | 1 |
| 06/24/02 | Dry | 62 | 1 | **10** | 1 | **10** | 1 |
| 07/01/02 | Dry | 300 | 0 | 25 | 1 | **10** | 1 |
| 07/08/02 | Dry | 69 | 1 | 12 | 1 | **10** | 1 |
| 07/15/02 | Dry | 94 | 1 | **10** | 1 | **10** | 1 |
| 07/22/02 | Wet | 147 | 1 | 44 | 1 | 173 | 1 |
| 07/29/02 | Wet | 88 | 1 | 32 | 1 | 20 | 1 |
| 08/05/02 | Dry | 19 | 1 | 31 | 1 | 12 | 1 |
| 08/12/02 | Dry | 28 | 1 | 60 | 1 | 30 | 1 |
| 08/19/02 | Wet | 36500 | 0 | 6000 | 0 | 840 | 0 |
| 08/26/02 | Wet | 120 | 1 | 180 | 1 | 32 | 1 |
| 08/28/02 | Dry | 93 | 1 | 20 | 1 | 37 | 1 |
| 09/04/02 | Dry | 43 | 1 | 28 | 1 | 8 | 1 |

| Date | OES Sampling Locations | | | | | | |
|---|---|---|---|---|---|---|---|
| | Wet or Dry? | 16th Street | | 71st Street | | 79th Street | |
| | | E. Coli (col/100 mL) | % Compliance | E. Coli (col/100 mL) | % Compliance | E. Coli (col/100 mL) | % Compliance |
| 09/09/02 | Dry | 37 | 1 | 31 | 1 | 3 | 1 |
| 09/16/02 | Wet | 660 | 0 | 34 | 1 | 20 | 1 |
| 09/23/02 | Wet | 1050 | 0 | 500 | 0 | 48 | 1 |
| 09/30/02 | Dry | 220 | 1 | 44 | 1 | 31 | 1 |
| 10/01/02 | Dry | 110 | 1 | 75 | 1 | 40 | 1 |
| 10/07/02 | Dry | 290 | 0 | 90 | 1 | 47 | 1 |
| 10/14/02 | Wet | 100 | 1 | 72 | 1 | 25 | 1 |
| 10/21/02 | Wet | 270 | 0 | 25 | 1 | 22 | 1 |
| 10/28/02 | Dry | 1350 | 0 | 16 | 1 | 6 | 1 |

| Date | MCHD Sampling Locations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Emerson Way | | | | | 38th Street | | | | | |
| | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) | Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) |
| 1/4/2000 | Wet | 450 | 0 | 09/05/00 | 1340 | 1/4/2000 | Wet | 490 | 0 | 09/05/00 | 2030 |
| 1/11/2000 | Wet | 100 | 1 | 09/12/00 | 630 | 1/11/2000 | Wet | 100 | 1 | 09/12/00 | 1100 |
| 1/12/2000 | Dry | 100 | 1 | | | 1/12/2000 | Dry | 100 | 1 | | |
| 1/19/2000 | Dry | 10 | 1 | | | 1/19/2000 | Dry | 10 | 1 | | |
| 1/25/2000 | Dry | | | | | 1/25/2000 | Dry | 10 | 1 | | |
| 2/1/2000 | Dry | | | | | 2/1/2000 | Dry | 20 | 1 | | |
| 2/8/2000 | Dry | 10 | 1 | | | 2/8/2000 | Dry | 10 | 1 | | |
| 2/15/2000 | Wet | 10 | 1 | | | 2/15/2000 | Wet | 100 | 1 | | |
| 2/22/2000 | Wet | 50 | 1 | | | 2/22/2000 | Wet | 140 | 1 | | |
| 2/29/2000 | Dry | 20 | 1 | | | 2/29/2000 | Dry | 30 | 1 | | |
| 3/7/2000 | Dry | 30 | 1 | | | 3/7/2000 | Dry | 70 | 1 | | |
| 3/14/2000 | Dry | 10 | 1 | | | 3/14/2000 | Dry | 10 | 1 | | |
| 3/21/2000 | Wet | 110 | 1 | | | 3/21/2000 | Wet | 240 | 0 | | |
| 3/22/2000 | Dry | 50 | 1 | | | 3/22/2000 | Dry | 140 | 1 | | |
| 3/28/2000 | Wet | 20 | 1 | | | 3/28/2000 | Wet | 140 | 1 | | |
| 4/7/2000 | Wet | 200 | 1 | | | 4/7/2000 | Wet | 800 | 0 | | |
| 4/11/2000 | Wet | 100 | 1 | | | 4/11/2000 | Wet | 100 | 1 | | |
| 4/18/2000 | Wet | 100 | 1 | | | 4/18/2000 | Wet | 700 | 0 | | |
| 4/19/2000 | Wet | 100 | 1 | | | 4/19/2000 | Wet | 300 | 0 | | |
| 4/25/2000 | Wet | 80 | 1 | | | 4/25/2000 | Wet | 40 | 1 | | |
| 5/2/2000 | Wet | 390 | 0 | | | 5/2/2000 | Wet | 450 | 0 | | |
| 5/9/2000 | Dry | 100 | 1 | | | 5/9/2000 | Dry | 100 | 1 | | |
| 5/16/2000 | Wet | 90 | 1 | | | 5/16/2000 | Wet | 220 | 1 | | |
| 5/23/2000 | Wet | 210 | 1 | | | 5/23/2000 | Wet | 240 | 0 | | |
| 5/31/2000 | Dry | 110 | 1 | | | 5/31/2000 | Dry | 200 | 1 | | |
| 6/6/2000 | Wet | 170 | 1 | | | 6/6/2000 | Wet | 320 | 0 | | |
| 6/13/2000 | Wet | 410 | 0 | | | 6/13/2000 | Wet | 350 | 0 | | |
| 6/14/2000 | Dry | 310 | 0 | | | 6/14/2000 | Dry | 260 | 0 | | |
| 6/20/2000 | Dry | 260 | 0 | | | 6/20/2000 | Dry | 290 | 0 | | |
| 6/27/2000 | Wet | 60 | 1 | | | 6/27/2000 | Wet | 210 | 1 | | |
| 7/5/2000 | Wet | 1900 | 0 | | | 7/5/2000 | Wet | 5800 | 0 | | |
| 7/11/2000 | Dry | 180 | 1 | | | 7/11/2000 | Dry | 160 | 1 | | |
| 7/18/2000 | Dry | 220 | 1 | | | 7/18/2000 | Dry | 130 | 1 | | |
| 7/19/2000 | Wet | 3400 | 0 | | | 7/19/2000 | Wet | 800 | 0 | | |
| 7/25/2000 | Dry | 50 | 1 | | | 7/25/2000 | Dry | 130 | 1 | | |
| 8/1/2000 | Wet | 700 | 0 | | | 8/1/2000 | Wet | 600 | 0 | | |
| 8/8/2000 | Wet | 500 | 0 | | | 8/8/2000 | Wet | 1300 | 0 | | |
| 8/15/2000 | Dry | 130 | 1 | | | 8/15/2000 | Dry | 370 | 0 | | |
| 8/22/2000 | Dry | 250 | 0 | | | 8/22/2000 | Dry | 1400 | 0 | | |
| 8/29/2000 | Dry | 130 | 1 | | | 8/29/2000 | Dry | 240 | 0 | | |
| 9/19/2000 | Dry | 200 | 1 | | | 9/19/2000 | Dry | 200 | 1 | | |
| 9/26/2000 | Wet | 1580 | 0 | | | 9/26/2000 | Wet | 1750 | 0 | | |
| 9/27/2000 | Wet | 310 | 0 | | | 9/27/2000 | Wet | 410 | 0 | | |
| 10/3/2000 | Dry | 100 | 1 | | | 10/3/2000 | Dry | 100 | 1 | | |
| 10/10/2000 | Dry | 200 | 1 | | | 10/10/2000 | Dry | 100 | 1 | | |
| 10/17/2000 | Wet | 100 | 1 | | | 10/17/2000 | Wet | 100 | 1 | | |
| 10/24/2000 | Wet | 100 | 1 | | | 10/24/2000 | Wet | 300 | 0 | | |
| 11/1/2000 | Dry | 200 | 1 | | | 11/1/2000 | Dry | 100 | 1 | | |
| 11/7/2000 | Wet | 5560 | 0 | | | 11/7/2000 | Wet | 520 | 0 | | |
| 11/8/2000 | Wet | 200 | 1 | | | 11/8/2000 | Wet | 200 | 1 | | |
| 11/14/2000 | Wet | 100 | 1 | | | 11/14/2000 | Wet | 410 | 0 | | |
| 11/21/2000 | Dry | 100 | 1 | | | 11/21/2000 | Dry | 100 | 1 | | |
| 11/28/2000 | Dry | 100 | 1 | | | 11/28/2000 | Dry | 100 | 1 | | |
| 12/5/2000 | Dry | 100 | 1 | | | 12/5/2000 | Dry | 100 | 1 | | |
| 12/12/2000 | Wet | 1730 | 0 | | | 12/12/2000 | Wet | 1350 | 0 | | |
| 12/13/2000 | Wet | 630 | 0 | | | 12/13/2000 | Wet | 100 | 1 | | |
| 12/20/2000 | Wet | 100 | 1 | | | 12/20/2000 | Wet | 100 | 1 | | |
| 12/27/2000 | Wet | 50 | 1 | | | 12/27/2000 | Wet | 100 | 1 | | |
| 1/3/2001 | Dry | 100 | 1 | | | 1/3/2001 | Dry | 100 | 1 | | |
| 1/10/2001 | Dry | 50 | 1 | | | 1/10/2001 | Dry | 50 | 1 | | |
| 1/17/2001 | Dry | 200 | 1 | | | 1/17/2001 | Dry | 310 | 0 | | |
| 1/24/2001 | Dry | 200 | 1 | | | 1/24/2001 | Dry | 100 | 1 | | |
| 1/31/2001 | Wet | 2160 | 0 | | | 1/31/2001 | Wet | 3730 | 0 | | |
| 2/6/2001 | Wet | 100 | 1 | | | 2/6/2001 | Wet | 200 | 1 | | |
| 2/14/2001 | Wet | 310 | 0 | | | 2/14/2001 | Wet | 100 | 1 | | |
| 2/19/2001 | Dry | 200 | 1 | | | 2/19/2001 | Dry | 100 | 1 | | |
| 2/21/2001 | Dry | 100 | 1 | | | 2/21/2001 | Dry | 100 | 1 | | |
| 2/28/2001 | Dry | 100 | 1 | | | 2/28/2001 | Dry | 100 | 1 | | |
| 3/6/2001 | Dry | 100 | 1 | | | 3/6/2001 | Dry | 100 | 1 | | |
| 3/14/2001 | Wet | 100 | 1 | | | 3/14/2001 | Wet | 100 | 1 | | |
| 3/19/2001 | Dry | 100 | 1 | | | 3/19/2001 | Dry | 100 | 1 | | |
| 3/21/2001 | Dry | 100 | 1 | | | 3/21/2001 | Dry | 100 | 1 | | |

| Date | MCHD Sampling Locations | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Emerson Way | | | | | 38th Street | | | | | |
| | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) | Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) |
| 3/27/2001 | Dry | 100 | 1 | | | 3/27/2001 | Dry | 100 | 1 | | |
| 4/3/2001 | Dry | 100 | 1 | | | 4/3/2001 | Dry | 100 | 1 | | |
| 4/10/2001 | Wet | 200 | 1 | | | 4/10/2001 | Wet | 100 | 1 | | |
| 4/16/2001 | Wet | 410 | 0 | | | 4/16/2001 | Wet | 410 | 0 | | |
| 4/18/2001 | Dry | 100 | 1 | | | 4/18/2001 | Dry | 520 | 0 | | |
| 4/24/2001 | Wet | 310 | 0 | | | 4/24/2001 | Wet | 200 | 1 | | |
| 5/1/2001 | Dry | 200 | 1 | | | 5/1/2001 | Dry | 100 | 1 | | |
| 5/9/2001 | Wet | 2160 | 0 | | | 5/9/2001 | Wet | 2330 | 0 | | |
| 5/15/2001 | Dry | 630 | 0 | | | 5/15/2001 | Dry | 310 | 0 | | |
| 5/22/2001 | Wet | 520 | 0 | | | 5/22/2001 | Wet | 200 | 1 | | |
| 5/30/2001 | Wet | 100 | 1 | | | 5/30/2001 | Wet | 100 | 1 | | |
| 6/5/2001 | Wet | 100 | 1 | | | 6/5/2001 | Wet | 410 | 0 | | |
| 6/12/2001 | Dry | 100 | 1 | | | 6/12/2001 | Dry | 100 | 1 | | |
| 6/19/2001 | Dry | 100 | 1 | | | 6/19/2001 | Dry | 200 | 1 | | |
| 6/20/2001 | Wet | 520 | 0 | | | 6/20/2001 | Wet | 410 | 0 | | |
| 6/26/2001 | Dry | 200 | 1 | | | 6/26/2001 | Dry | 200 | 1 | | |
| 7/3/2001 | Wet | 410 | 0 | | | 7/3/2001 | Wet | 860 | 0 | | |
| 7/10/2001 | Wet | 630 | 0 | | | 7/10/2001 | Wet | 620 | 0 | | |
| 7/17/2001 | Dry | 100 | 1 | | | 7/17/2001 | Dry | 200 | 1 | | |
| 7/24/2001 | Wet | 250 | 0 | | | 7/24/2001 | Wet | 410 | 0 | | |
| 7/31/2001 | Dry | 200 | 1 | | | 7/31/2001 | Dry | 200 | 1 | | |
| 8/1/2001 | Dry | 200 | 1 | | | 8/1/2001 | Dry | 100 | 1 | | |
| 8/7/2001 | Dry | 100 | 1 | | | 8/7/2001 | Dry | 310 | 0 | | |
| 8/14/2001 | Dry | 1 | 1 | | | 8/14/2001 | Dry | 310 | 0 | | |
| 8/21/2001 | Wet | 630 | 0 | | | 8/21/2001 | Wet | 510 | 0 | | |
| 8/28/2001 | Dry | 1310 | 0 | | | 8/28/2001 | Dry | 200 | 1 | | |
| 9/5/2001 | Dry | 200 | 1 | | | 9/5/2001 | Dry | 410 | 0 | | |
| 9/11/2001 | Wet | 860 | 0 | | | 9/11/2001 | Wet | 840 | 0 | | |
| 9/18/2001 | Wet | 410 | 0 | | | 9/18/2001 | Wet | 310 | 0 | | |
| 9/25/2001 | Wet | 2310 | 0 | | | 9/25/2001 | Wet | 1350 | 0 | | |
| 9/26/2001 | Dry | 520 | 0 | | | 9/26/2001 | Dry | 310 | 0 | | |
| 10/2/2001 | Dry | 200 | 1 | | | 10/2/2001 | Dry | 630 | 0 | | |
| 10/9/2001 | Dry | 2010 | 0 | | | 10/9/2001 | Dry | 300 | 0 | | |
| 10/16/2001 | Wet | 860 | 0 | | | 10/16/2001 | Wet | 3500 | 0 | | |
| 10/23/2001 | Wet | 740 | 0 | | | 10/23/2001 | Wet | 68670 | 0 | | |
| 10/30/2001 | Dry | 100 | 1 | | | 10/30/2001 | Dry | 630 | 0 | | |
| 11/6/2001 | Dry | 100 | 1 | | | 11/6/2001 | Dry | 740 | 0 | | |
| 11/13/2001 | Dry | 100 | 1 | | | 11/13/2001 | Dry | 100 | 1 | | |
| 11/20/2001 | Wet | 310 | 0 | | | 11/20/2001 | Wet | 100 | 1 | | |
| 11/26/2001 | Wet | 200 | 1 | | | 11/26/2001 | Wet | 310 | 0 | | |
| 11/28/2001 | Wet | 100 | 1 | | | 11/28/2001 | Wet | 200 | 1 | | |
| 12/3/2001 | Dry | 100 | 1 | | | 12/3/2001 | Dry | 740 | 0 | | |
| 12/6/2001 | Wet | 310 | 0 | | | 12/6/2001 | Wet | 100 | 1 | | |
| 12/11/2001 | Dry | 520 | 0 | | | 12/11/2001 | Dry | 100 | 1 | | |
| 12/17/2001 | Wet | 2180 | 0 | | | 12/17/2001 | Wet | 5290 | 0 | | |
| 12/19/2001 | Wet | 420 | 0 | | | 12/19/2001 | Wet | 310 | 0 | | |
| 5/1/2002 | Dry | **10** | 1 | | | 05/01/02 | Dry | **10** | 1 | | |
| 5/7/2002 | Wet | 420 | 0 | | | 5/7/2002 | Wet | 760 | 0 | | |
| 5/14/2002 | Wet | 93 | 1 | | | 5/14/2002 | Wet | 133 | 1 | | |
| 5/21/2002 | Wet | 5 | 1 | | | 5/21/2002 | Wet | 11 | 1 | | |
| 5/28/2002 | Wet | 53 | 1 | | | 5/28/2002 | Wet | 67 | 1 | | |
| 6/3/2002 | Wet | 27 | 1 | | | 6/3/2002 | Wet | **20** | 1 | | |
| 6/10/2002 | Dry | 27 | 1 | | | 6/10/2002 | Dry | 107 | 1 | | |
| 6/12/2002 | Wet | **20** | 1 | | | 6/12/2002 | Wet | 460 | 0 | | |
| 6/17/2002 | Wet | 81 | 1 | | | 6/17/2002 | Wet | 94 | 1 | | |
| 6/24/2002 | Dry | 19 | 1 | | | 6/24/2002 | Dry | 56 | 1 | | |
| 7/1/2002 | Dry | 25 | 1 | | | 7/1/2002 | Dry | 140 | 1 | | |
| 7/8/2002 | Dry | 38 | 1 | | | 7/8/2002 | Dry | 25 | 1 | | |
| 7/15/2002 | Dry | 38 | 1 | | | 7/15/2002 | Dry | 170 | 1 | | |
| 7/22/2002 | Wet | 80 | 1 | | | 7/22/2002 | Wet | 120 | 1 | | |
| 7/29/2002 | Wet | 42 | 1 | | | 7/29/2002 | Wet | 60 | 1 | | |
| 8/5/2002 | Dry | 38 | 1 | | | 8/5/2002 | Dry | 81 | 1 | | |
| 8/12/2002 | Dry | 64 | 1 | | | 8/12/2002 | Dry | 112 | 1 | | |
| 8/19/2002 | Wet | 2700 | 0 | | | 8/19/2002 | Wet | 1400 | 0 | | |
| 8/26/2002 | Wet | 180 | 1 | | | 8/26/2002 | Wet | 100 | 1 | | |
| 8/28/2002 | Dry | 100 | 1 | | | 8/28/2002 | Dry | 100 | 1 | | |
| 9/4/2002 | Dry | 43 | 1 | | | 9/4/2002 | Dry | 43 | 1 | | |
| 9/9/2002 | Dry | 115 | 1 | | | 9/9/2002 | Dry | 70 | 1 | | |
| 9/16/2002 | Wet | 135 | 1 | | | 9/16/2002 | Wet | 220 | 1 | | |
| 9/23/2002 | Wet | 310 | 0 | | | 9/23/2002 | Wet | 220 | 1 | | |
| 9/30/2002 | Dry | 155 | 1 | | | 9/30/2002 | Dry | 230 | 1 | | |
| 10/1/2002 | Dry | 85 | 1 | | | 10/1/2002 | Dry | 137 | 1 | | |
| 10/7/2002 | Dry | 160 | 1 | | | 10/7/2002 | Dry | 50 | 1 | | |
| 10/14/2002 | Wet | 80 | 1 | | | 10/14/2002 | Wet | 85 | 1 | | |
| 10/21/2002 | Wet | 100 | 1 | | | 10/21/2002 | Wet | 113 | 1 | | |
| 10/28/2002 | Dry | 44 | 1 | | | 10/28/2002 | Dry | 130 | 1 | | |

| MCHD Sampling Locations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 30th Street | | | | | | Central Avenue | | | | | |
| Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) | Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) |
| 01/04/00 | Wet | 2200 | 0 | 09/05/00 | 2280 | 01/04/00 | Wet | 2100 | 0 | 09/05/00 | 3730 |
| 01/11/00 | Wet | 300 | 0 | 09/12/00 | 4520 | 01/11/00 | Wet | 100 | 1 | 09/12/00 | 3320 |
| 01/12/00 | Dry | 200 | 1 | | | 01/12/00 | Dry | 600 | 0 | | |
| 01/19/00 | Dry | 50 | 1 | | | 01/19/00 | Dry | 20 | 1 | | |
| 01/25/00 | Dry | 20 | 1 | | | 01/25/00 | Dry | 60 | 1 | | |
| 02/01/00 | Dry | 40 | 1 | | | 02/01/00 | Dry | 230 | 1 | | |
| 02/08/00 | Dry | 10 | 1 | | | 02/08/00 | Dry | 30 | 1 | | |
| 02/15/00 | Wet | 220 | 1 | | | 02/15/00 | Wet | 200 | 1 | | |
| 02/22/00 | Wet | 3500 | 0 | | | 02/22/00 | Wet | 8000 | 0 | | |
| 02/29/00 | Dry | 400 | 0 | | | 02/29/00 | Dry | 400 | 0 | | |
| 03/07/00 | Dry | 130 | 1 | | | 03/07/00 | Dry | 270 | 0 | | |
| 03/14/00 | Dry | 20 | 1 | | | 03/14/00 | Dry | 40 | 1 | | |
| 03/21/00 | Wet | 620 | 0 | | | 03/21/00 | Wet | 720 | 0 | | |
| 03/22/00 | Dry | 130 | 1 | | | 03/22/00 | Dry | 170 | 1 | | |
| 03/28/00 | Wet | 120 | 1 | | | 03/28/00 | Wet | 60 | 1 | | |
| 04/07/00 | Wet | 55000 | 0 | | | 04/07/00 | Wet | 72000 | 0 | | |
| 04/11/00 | Wet | 300 | 0 | | | 04/11/00 | Wet | 100 | 1 | | |
| 04/18/00 | Wet | 1100 | 0 | | | 04/18/00 | Wet | 500 | 0 | | |
| 04/19/00 | Wet | 200 | 1 | | | 04/19/00 | Wet | 200 | 1 | | |
| 04/25/00 | Wet | 120 | 1 | | | 04/25/00 | Wet | 170 | 1 | | |
| 05/02/00 | Wet | 560 | 0 | | | 05/02/00 | Wet | 1300 | 0 | | |
| 05/09/00 | Dry | 100 | 1 | | | 05/09/00 | Dry | 100 | 1 | | |
| 05/16/00 | Wet | 320 | 0 | | | 05/16/00 | Wet | 220 | 1 | | |
| 05/23/00 | Wet | 440 | 0 | | | 05/23/00 | Wet | 900 | 0 | | |
| 05/31/00 | Dry | 320 | 0 | | | 05/31/00 | Dry | 470 | 0 | | |
| 06/06/00 | Wet | 260 | 0 | | | 06/06/00 | Wet | 320 | 0 | | |
| 06/13/00 | Wet | 260 | 0 | | | 06/13/00 | Wet | 280 | 0 | | |
| 06/14/00 | Dry | 330 | 0 | | | 06/14/00 | Dry | 370 | 0 | | |
| 06/20/00 | Dry | 360 | 0 | | | 06/20/00 | Dry | 430 | 0 | | |
| 06/27/00 | Wet | 280 | 0 | | | 06/27/00 | Wet | 290 | 0 | | |
| 07/05/00 | Wet | 5900 | 0 | | | 07/05/00 | Wet | 6300 | 0 | | |
| 07/11/00 | Dry | 270 | 0 | | | 07/11/00 | Dry | 230 | 1 | | |
| 07/18/00 | Dry | 110 | 1 | | | 07/18/00 | Dry | 160 | 1 | | |
| 07/19/00 | Wet | 180 | 1 | | | 07/19/00 | Wet | 270 | 0 | | |
| 07/25/00 | Dry | 150 | 1 | | | 07/25/00 | Dry | 240 | 0 | | |
| 08/01/00 | Wet | 2100 | 0 | | | 08/01/00 | Wet | 1600 | 0 | | |
| 08/08/00 | Wet | 3100 | 0 | | | 08/08/00 | Wet | 3700 | 0 | | |
| 08/15/00 | Dry | 1100 | 0 | | | 08/15/00 | Dry | 900 | 0 | | |
| 08/22/00 | Dry | | 1 | | | 08/22/00 | Dry | 1000 | 0 | | |
| 08/29/00 | Dry | 390 | 0 | | | 08/29/00 | Dry | 470 | 0 | | |
| 09/19/00 | Dry | 100 | 1 | | | 09/19/00 | Dry | 520 | 0 | | |
| 09/26/00 | Wet | 3360 | 0 | | | 09/26/00 | Wet | 7430 | 0 | | |
| 09/27/00 | Wet | 1870 | 0 | | | 09/27/00 | Wet | 2110 | 0 | | |
| 10/03/00 | Dry | 310 | 0 | | | 10/03/00 | Dry | 100 | 1 | | |
| 10/10/00 | Dry | 200 | 1 | | | 10/10/00 | Dry | 100 | 1 | | |
| 10/17/00 | Wet | 630 | 0 | | | 10/17/00 | Wet | 100 | 1 | | |
| 10/24/00 | Wet | 100 | 1 | | | 10/24/00 | Wet | 100 | 1 | | |
| 11/01/00 | Dry | 100 | 1 | | | 11/01/00 | Dry | 100 | 1 | | |
| 11/07/00 | Wet | 2110 | 0 | | | 11/07/00 | Wet | 3180 | 0 | | |
| 11/08/00 | Wet | 740 | 0 | | | 11/08/00 | Wet | 1100 | 0 | | |
| 11/14/00 | Wet | 200 | 1 | | | 11/14/00 | Wet | 410 | 0 | | |
| 11/21/00 | Dry | 100 | 1 | | | 11/21/00 | Dry | 100 | 1 | | |
| 11/28/00 | Dry | 410 | 0 | | | 11/28/00 | Dry | 300 | 0 | | |
| 12/05/00 | Dry | 100 | 1 | | | 12/05/00 | Dry | 200 | 1 | | |
| 12/12/00 | Wet | 3930 | 0 | | | 12/12/00 | Wet | 3540 | 0 | | |
| 12/13/00 | Wet | 520 | 0 | | | 12/13/00 | Wet | 520 | 0 | | |
| 12/20/00 | Wet | 520 | 0 | | | 12/20/00 | Wet | 200 | 1 | | |
| 12/27/00 | Wet | 200 | 1 | | | 12/27/00 | Wet | 100 | 1 | | |
| 01/03/01 | Dry | 100 | 1 | | | 01/03/01 | Dry | 100 | 1 | | |
| 01/10/01 | Dry | 50 | 1 | | | 01/10/01 | Dry | 100 | 1 | | |
| 01/17/01 | Dry | 100 | 1 | | | 01/17/01 | Dry | 100 | 1 | | |
| 01/24/01 | Dry | 100 | 1 | | | 01/24/01 | Dry | 100 | 1 | | |
| 01/31/01 | Wet | 2230 | 0 | | | 01/31/01 | Wet | 980 | 0 | | |
| 02/06/01 | Wet | 100 | 1 | | | 02/06/01 | Wet | 100 | 1 | | |
| 02/14/01 | Wet | 100 | 1 | | | 02/14/01 | Wet | 630 | 0 | | |
| 02/19/01 | Dry | 100 | 1 | | | 02/19/01 | Dry | 100 | 1 | | |
| 02/21/01 | Dry | 100 | 1 | | | 02/21/01 | Dry | 100 | 1 | | |
| 02/28/01 | Dry | 100 | 1 | | | 02/28/01 | Dry | 100 | 1 | | |
| 03/06/01 | Dry | 100 | 1 | | | 03/06/01 | Dry | 100 | 1 | | |
| 03/14/01 | Wet | 100 | 1 | | | 03/14/01 | Wet | 100 | 1 | | |
| 03/19/01 | Dry | 300 | 0 | | | 03/19/01 | Dry | 200 | 1 | | |
| 03/21/01 | Dry | 200 | 1 | | | 03/21/01 | Dry | 100 | 1 | | |

| MCHD Sampling Locations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 30th Street | | | | | | Central Avenue | | | | | |
| Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) | Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) |
| 03/27/01 | Dry | 100 | 1 | | | 03/27/01 | Dry | 100 | 1 | | |
| 04/03/01 | Dry | 100 | 1 | | | 04/03/01 | Dry | 100 | 1 | | |
| 04/10/01 | Wet | 410 | 0 | | | 04/10/01 | Wet | 200 | 1 | | |
| 04/16/01 | Wet | 310 | 0 | | | 04/16/01 | Wet | 200 | 1 | | |
| 04/18/01 | Dry | 100 | 1 | | | 04/18/01 | Dry | 200 | 1 | | |
| 04/24/01 | Wet | 410 | 0 | | | 04/24/01 | Wet | 100 | 1 | | |
| 05/01/01 | Dry | 100 | 1 | | | 05/01/01 | Dry | 200 | 1 | | |
| 05/09/01 | Wet | 8360 | 0 | | | 05/09/01 | Wet | 9330 | 0 | | |
| 05/15/01 | Dry | 740 | 0 | | | 05/15/01 | Dry | 520 | 0 | | |
| 05/22/01 | Wet | 620 | 0 | | | 05/22/01 | Wet | 200 | 1 | | |
| 05/30/01 | Wet | 200 | 1 | | | 05/30/01 | Wet | 200 | 1 | | |
| 06/05/01 | Wet | 1340 | 0 | | | 06/05/01 | Wet | 1340 | 0 | | |
| 06/12/01 | Dry | 200 | 1 | | | 06/12/01 | Dry | 200 | 1 | | |
| 06/19/01 | Dry | 410 | 0 | | | 06/19/01 | Dry | 830 | 0 | | |
| 06/20/01 | Wet | 1200 | 0 | | | 06/20/01 | Wet | 1730 | 0 | | |
| 06/26/01 | Dry | 520 | 0 | | | 06/26/01 | Dry | 520 | 0 | | |
| 07/03/01 | Wet | 2160 | 0 | | | 07/03/01 | Wet | 2620 | 0 | | |
| 07/10/01 | Wet | 850 | 0 | | | 07/10/01 | Wet | 1890 | 0 | | |
| 07/17/01 | Dry | 100 | 1 | | | 07/17/01 | Dry | 410 | 0 | | |
| 07/24/01 | Wet | 100 | 1 | | | 07/24/01 | Wet | 200 | 1 | | |
| 07/31/01 | Dry | 510 | 0 | | | 07/31/01 | Dry | 300 | 0 | | |
| 08/01/01 | Dry | 310 | 0 | | | 08/01/01 | Dry | 410 | 0 | | |
| 08/07/01 | Dry | 100 | 1 | | | 08/07/01 | Dry | 200 | 1 | | |
| 08/14/01 | Dry | 100 | 1 | | | 08/14/01 | Dry | 100 | 1 | | |
| 08/21/01 | Wet | 2560 | 0 | | | 08/21/01 | Wet | 1710 | 0 | | |
| 08/28/01 | Dry | 410 | 0 | | | 08/28/01 | Dry | 520 | 0 | | |
| 09/05/01 | Dry | 200 | 1 | | | 09/05/01 | Dry | 200 | 1 | | |
| 09/11/01 | Wet | 740 | 0 | | | 09/11/01 | Wet | 1340 | 0 | | |
| 09/18/01 | Wet | 100 | 1 | | | 09/18/01 | Wet | 720 | 0 | | |
| 09/25/01 | Wet | 2310 | 0 | | | 09/25/01 | Wet | 3680 | 0 | | |
| 09/26/01 | Dry | 740 | 0 | | | 09/26/01 | Dry | 970 | 0 | | |
| 10/02/01 | Dry | 850 | 0 | | | 10/02/01 | Dry | 310 | 0 | | |
| 10/09/01 | Dry | 720 | 0 | | | 10/09/01 | Dry | 2460 | 0 | | |
| 10/16/01 | Wet | 5980 | 0 | | | 10/16/01 | Wet | 7890 | 0 | | |
| 10/23/01 | Wet | 104624 | 0 | | | 10/23/01 | Wet | 10500 | 0 | | |
| 10/30/01 | Dry | 100 | 1 | | | 10/30/01 | Dry | 100 | 1 | | |
| 11/06/01 | Dry | 100 | 1 | | | 11/06/01 | Dry | 100 | 1 | | |
| 11/13/01 | Dry | 100 | 1 | | | 11/13/01 | Dry | 100 | 1 | | |
| 11/20/01 | Wet | 200 | 1 | | | 11/20/01 | Wet | 100 | 1 | | |
| 11/26/01 | Wet | 1190 | 0 | | | 11/26/01 | Wet | 740 | 0 | | |
| 11/28/01 | Wet | 10810 | 0 | | | 11/28/01 | Wet | 100 | 1 | | |
| 12/03/01 | Dry | 310 | 0 | | | 12/03/01 | Dry | 300 | 0 | | |
| 12/06/01 | Wet | 520 | 0 | | | 12/06/01 | Wet | 200 | 1 | | |
| 12/11/01 | Dry | 100 | 1 | | | 12/11/01 | Dry | 300 | 0 | | |
| 12/17/01 | Wet | 23590 | 0 | | | 12/17/01 | Wet | 14550 | 0 | | |
| 12/19/01 | Wet | 520 | 0 | | | 12/19/01 | Wet | 100 | 1 | | |
| 05/01/02 | Dry | 24 | 1 | | | 05/01/02 | Dry | 40 | 1 | | |
| 5/7/2002 | Wet | 4400 | 0 | | | 5/7/2002 | Wet | 2650 | 0 | | |
| 5/14/2002 | Wet | 540 | 0 | | | 5/14/2002 | Wet | 200 | 1 | | |
| 5/21/2002 | Wet | 22 | 1 | | | 5/21/2002 | Wet | 16 | 1 | | |
| 5/28/2002 | Wet | 360 | 0 | | | 5/28/2002 | Wet | 540 | 0 | | |
| 6/3/2002 | Wet | 27 | 1 | | | 6/3/2002 | Wet | 40 | 1 | | |
| 6/10/2002 | Dry | 53 | 1 | | | 6/10/2002 | Dry | 93 | 1 | | |
| 6/12/2002 | Wet | 880 | 0 | | | 6/12/2002 | Wet | 750 | 0 | | |
| 6/17/2002 | Wet | 56 | 1 | | | 6/17/2002 | Wet | 138 | 1 | | |
| 6/24/2002 | Dry | 81 | 1 | | | 6/24/2002 | Dry | 19 | 1 | | |
| 7/1/2002 | Dry | 150 | 1 | | | 7/1/2002 | Dry | 190 | 1 | | |
| 7/8/2002 | Dry | 12 | 1 | | | 7/8/2002 | Dry | 50 | 1 | | |
| 7/15/2002 | Dry | 56 | 1 | | | 7/15/2002 | Dry | 75 | 1 | | |
| 7/22/2002 | Wet | 220 | 1 | | | 7/22/2002 | Wet | 300 | 0 | | |
| 7/29/2002 | Wet | 80 | 1 | | | 7/29/2002 | Wet | 104 | 1 | | |
| 8/5/2002 | Dry | 56 | 1 | | | 8/5/2002 | Dry | 50 | 1 | | |
| 8/12/2002 | Dry | 80 | 1 | | | 8/12/2002 | Dry | 88 | 1 | | |
| 8/19/2002 | Wet | **50500** | 0 | | | 8/19/2002 | Wet | **88500** | 0 | | |
| 8/26/2002 | Wet | 370 | 0 | | | 8/26/2002 | Wet | 240 | 0 | | |
| 8/28/2002 | Dry | 183 | 1 | | | 8/28/2002 | Dry | 125 | 1 | | |
| 9/4/2002 | Dry | 30 | 1 | | | 9/4/2002 | Dry | 31 | 1 | | |
| 9/9/2002 | Dry | 300 | 0 | | | 9/9/2002 | Dry | 620 | 0 | | |
| 9/16/2002 | Wet | 600 | 0 | | | 9/16/2002 | Wet | 520 | 0 | | |
| 9/23/2002 | Wet | 650 | 0 | | | 9/23/2002 | Wet | 392 | 0 | | |
| 9/30/2002 | Dry | 240 | 0 | | | 9/30/2002 | Dry | 240 | 0 | | |
| 10/1/2002 | Dry | 260 | 0 | | | 10/1/2002 | Dry | 200 | 1 | | |
| 10/7/2002 | Dry | 1100 | 0 | | | 10/7/2002 | Dry | 1050 | 0 | | |
| 10/14/2002 | Wet | 93 | 1 | | | 10/14/2002 | Wet | 190 | 1 | | |
| 10/21/2002 | Wet | 310 | 0 | | | 10/21/2002 | Wet | 800 | 0 | | |
| 10/28/2002 | Dry | 1100 | 0 | | | 10/28/2002 | Dry | 1200 | 0 | | |

## MCHD Sampling Locations

### Capitol Avenue

| Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance |
|---|---|---|---|
| 01/04/00 | Wet | 2400 | 0 |
| 01/11/00 | Wet | 400 | 0 |
| 01/12/00 | Dry | 100 | 1 |
| 01/19/00 | Dry | 40 | 1 |
| 01/25/00 | Dry | 20 | 1 |
| 02/01/00 | Dry | 90 | 1 |
| 02/08/00 | Dry | 10 | 1 |
| 02/15/00 | Wet | 260 | 0 |
| 02/22/00 | Wet | 8000 | 0 |
| 02/29/00 | Dry | 100 | 1 |
| 03/07/00 | Dry | 260 | 0 |
| 03/14/00 | Dry | 60 | 1 |
| 03/21/00 | Wet | 280 | 0 |
| 03/22/00 | Dry | 80 | 1 |
| 03/28/00 | Wet | 70 | 1 |
| 04/07/00 | Wet | 74000 | 0 |
| 04/11/00 | Wet | 300 | 0 |
| 04/18/00 | Wet | 100 | 1 |
| 04/19/00 | Wet | 300 | 0 |
| 04/25/00 | Wet | 150 | 1 |
| 05/16/00 | Wet | 360 | 0 |
| 05/23/00 | Wet | 1300 | 0 |
| 05/31/00 | Dry | 290 | 0 |
| 06/06/00 | Wet | 270 | 0 |
| 06/13/00 | Wet | 290 | 0 |
| 06/14/00 | Dry | 260 | 0 |
| 06/20/00 | Dry | 450 | 0 |
| 06/27/00 | Wet | 230 | 1 |
| 07/05/00 | Wet | 5500 | 0 |
| 07/11/00 | Dry | 180 | 1 |
| 07/18/00 | Dry | 270 | 0 |
| 07/19/00 | Wet | 240 | 0 |
| 07/25/00 | Dry | 80 | 1 |
| 08/01/00 | Wet | 1500 | 0 |
| 08/08/00 | Wet | 5200 | 0 |
| 08/15/00 | Dry | 320 | 0 |
| 08/22/00 | Dry | 1400 | 0 |
| 08/29/00 | Dry | 310 | 0 |
| 09/19/00 | Dry | 520 | 0 |
| 09/26/00 | Wet | 10120 | 0 |
| 09/27/00 | Wet | 2850 | 0 |
| 10/03/00 | Dry | 520 | 0 |
| 10/10/00 | Dry | 520 | 0 |
| 10/17/00 | Wet | 410 | 0 |
| 10/24/00 | Wet | 310 | 0 |
| 11/01/00 | Dry | 310 | 0 |
| 11/07/00 | Wet | 7800 | 0 |
| 11/08/00 | Wet | 1580 | 0 |
| 11/14/00 | Wet | 520 | 0 |
| 11/21/00 | Dry | 620 | 0 |
| 11/28/00 | Dry | 310 | 0 |
| 12/05/00 | Dry | 200 | 1 |
| 12/12/00 | Wet | 4960 | 0 |
| 12/13/00 | Wet | 410 | 0 |
| 12/20/00 | Wet | | 1 |
| 12/27/00 | Wet | | 1 |
| 01/03/01 | Dry | 100 | 1 |
| 01/10/01 | Dry | 100 | 1 |
| 01/17/01 | Dry | 100 | 1 |
| 01/24/01 | Dry | 100 | 1 |
| 01/31/01 | Wet | 2750 | 0 |
| 02/06/01 | Wet | 100 | 1 |
| 02/14/01 | Wet | 100 | 1 |
| 02/19/01 | Dry | 100 | 1 |
| 02/21/01 | Dry | 100 | 1 |
| 02/28/01 | Dry | 100 | 1 |
| 03/06/01 | Dry | 100 | 1 |
| 03/14/01 | Wet | 100 | 1 |
| 03/19/01 | Dry | 200 | 1 |
| 03/21/01 | Dry | 100 | 1 |
| 03/27/01 | Dry | 100 | 1 |
| 04/03/01 | Dry | 100 | 1 |

| Date | Questionable Data (col/100 mL) |
|---|---|
| 05/02/00 | 2800 |
| 05/09/00 | 410 |
| 09/05/00 | 5120 |
| 09/12/00 | 5710 |

### Martin L. King Blvd

| Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance |
|---|---|---|---|
| 01/04/00 | Wet | 15000 | 0 |
| 01/11/00 | Wet | 300 | 0 |
| 01/12/00 | Dry | 100 | 1 |
| 01/19/00 | Dry | 10 | 1 |
| 01/25/00 | Dry | 10 | 1 |
| 02/01/00 | Dry | 10 | 1 |
| 02/08/00 | Dry | 10 | 1 |
| 02/15/00 | Wet | 290 | 0 |
| 02/22/00 | Wet | 700 | 0 |
| 02/29/00 | Dry | 130 | 1 |
| 03/07/00 | Dry | 40 | 1 |
| 03/14/00 | Dry | 10 | 1 |
| 03/21/00 | Wet | 410 | 0 |
| 03/22/00 | Dry | 110 | 1 |
| 03/28/00 | Wet | 130 | 1 |
| 04/07/00 | Wet | 21000 | 0 |
| 04/11/00 | Wet | 200 | 1 |
| 04/18/00 | Wet | 600 | 0 |
| 04/19/00 | Wet | 300 | 0 |
| 04/25/00 | Wet | 240 | 0 |
| 05/16/00 | Wet | 470 | 0 |
| 05/23/00 | Wet | 1100 | 0 |
| 05/31/00 | Dry | 360 | 0 |
| 06/06/00 | Wet | 310 | 0 |
| 06/13/00 | Wet | 270 | 0 |
| 06/14/00 | Dry | 230 | 1 |
| 06/20/00 | Dry | 700 | 0 |
| 06/27/00 | Wet | 900 | 0 |
| 07/05/00 | Wet | 3300 | 0 |
| 07/11/00 | Dry | 240 | 0 |
| 07/18/00 | Dry | 150 | 1 |
| 07/19/00 | Wet | 170 | 1 |
| 07/25/00 | Dry | 70 | 1 |
| 08/01/00 | Wet | 2300 | 0 |
| 08/08/00 | Wet | 10000 | 0 |
| 08/15/00 | Dry | 130 | 1 |
| 08/22/00 | Dry | 1100 | 0 |
| 08/29/00 | Dry | 300 | 0 |
| 09/19/00 | Dry | 730 | 0 |
| 09/26/00 | Wet | 14550 | 0 |
| 09/27/00 | Wet | 2750 | 0 |
| 10/03/00 | Dry | 310 | 0 |
| 10/10/00 | Dry | 200 | 1 |
| 10/17/00 | Wet | 980 | 0 |
| 10/24/00 | Wet | 200 | 1 |
| 11/01/00 | Dry | 100 | 1 |
| 11/07/00 | Wet | 98040 | 0 |
| 11/08/00 | Wet | 1450 | 0 |
| 11/14/00 | Wet | 630 | 0 |
| 11/21/00 | Dry | 300 | 0 |
| 11/28/00 | Dry | 630 | 0 |
| 12/05/00 | Dry | 410 | 0 |
| 12/12/00 | Wet | 5730 | 0 |
| 12/13/00 | Wet | 7980 | 0 |
| 12/20/00 | Wet | 100 | 1 |
| 12/27/00 | Wet | 50 | 1 |
| 01/03/01 | Dry | 100 | 1 |
| 01/10/01 | Dry | 200 | 1 |
| 01/17/01 | Dry | 100 | 1 |
| 01/24/01 | Dry | 100 | 1 |
| 01/31/01 | Wet | 2110 | 0 |
| 02/06/01 | Wet | 200 | 1 |
| 02/14/01 | Wet | 200 | 1 |
| 02/19/01 | Dry | 100 | 1 |
| 02/21/01 | Dry | 100 | 1 |
| 02/28/01 | Dry | 100 | 1 |
| 03/06/01 | Dry | 100 | 1 |
| 03/14/01 | Wet | 100 | 1 |
| 03/19/01 | Dry | 200 | 1 |
| 03/21/01 | Dry | 100 | 1 |
| 03/27/01 | Dry | 100 | 1 |
| 04/03/01 | Dry | 100 | 1 |

| Date | Questionable Data (col/100 mL) |
|---|---|
| 05/02/00 | 5900 |
| 05/09/00 | 630 |
| 09/05/00 | 6380 |
| 09/12/00 | 19180 |

| MCHD Sampling Locations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Capitol Avenue | | | | | | Martin L. King Blvd | | | | | |
| Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) | Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) |
| 04/10/01 | Wet | 100 | 1 | | | 04/10/01 | Wet | 100 | 1 | | |
| 04/16/01 | Wet | 520 | 0 | | | 04/16/01 | Wet | 860 | 0 | | |
| 04/18/01 | Dry | 100 | 1 | | | 04/18/01 | Dry | 100 | 1 | | |
| 04/24/01 | Wet | 410 | 0 | | | 04/24/01 | Wet | 200 | 1 | | |
| 05/01/01 | Dry | 310 | 0 | | | 05/01/01 | Dry | 100 | 1 | | |
| 05/09/01 | Wet | 14970 | 0 | | | 05/09/01 | Wet | 18500 | 0 | | |
| 05/15/01 | Dry | 410 | 0 | | | 05/15/01 | Dry | 310 | 0 | | |
| 05/22/01 | Wet | 410 | 0 | | | 05/22/01 | Wet | 200 | 1 | | |
| 05/30/01 | Wet | 310 | 0 | | | 05/30/01 | Wet | 100 | 1 | | |
| 06/05/01 | Wet | 1560 | 0 | | | 06/05/01 | Wet | 3280 | 0 | | |
| 06/12/01 | Dry | 310 | 0 | | | 06/12/01 | Dry | 200 | 1 | | |
| 06/19/01 | Dry | 310 | 0 | | | 06/19/01 | Dry | 2030 | 0 | | |
| 06/20/01 | Wet | 1460 | 0 | | | 06/20/01 | Wet | 4570 | 0 | | |
| 06/26/01 | Dry | 100 | 1 | | | 06/26/01 | Dry | 720 | 0 | | |
| 07/03/01 | Wet | 2780 | 0 | | | 07/03/01 | Wet | 2780 | 0 | | |
| 07/10/01 | Wet | 850 | 0 | | | 07/10/01 | Wet | 2160 | 0 | | |
| 07/17/01 | Dry | 410 | 0 | | | 07/17/01 | Dry | 100 | 1 | | |
| 07/24/01 | Wet | 100 | 1 | | | 07/24/01 | Wet | 310 | 0 | | |
| 07/31/01 | Dry | 840 | 0 | | | 07/31/01 | Dry | 630 | 0 | | |
| 08/01/01 | Dry | 100 | 1 | | | 08/01/01 | Dry | 410 | 0 | | |
| 08/07/01 | Dry | 310 | 0 | | | 08/07/01 | Dry | 520 | 0 | | |
| 08/14/01 | Dry | 200 | 1 | | | 08/14/01 | Dry | 100 | 1 | | |
| 08/21/01 | Wet | 2780 | 0 | | | 08/21/01 | Wet | 3090 | 0 | | |
| 08/28/01 | Dry | 860 | 0 | | | 08/28/01 | Dry | 310 | 0 | | |
| 09/05/01 | Dry | 740 | 0 | | | 09/05/01 | Dry | 100 | 1 | | |
| 09/11/01 | Wet | 1460 | 0 | | | 09/11/01 | Wet | 1420 | 0 | | |
| 09/18/01 | Wet | 630 | 0 | | | 09/18/01 | Wet | 300 | 0 | | |
| 09/25/01 | Wet | 3500 | 0 | | | 09/25/01 | Wet | 3450 | 0 | | |
| 09/26/01 | Dry | 850 | 0 | | | 09/26/01 | Dry | 2280 | 0 | | |
| 10/02/01 | Dry | 100 | 1 | | | 10/02/01 | Dry | 310 | 0 | | |
| 10/09/01 | Dry | 1280 | 0 | | | 10/09/01 | Dry | 1220 | 0 | | |
| 10/16/01 | Wet | 10190 | 0 | | | 10/16/01 | Wet | 6440 | 0 | | |
| 10/23/01 | Wet | 620 | 0 | | | 10/23/01 | Wet | 100 | 1 | | |
| 10/30/01 | Dry | 630 | 0 | | | 10/30/01 | Dry | 520 | 0 | | |
| 11/06/01 | Dry | 100 | 1 | | | 11/06/01 | Dry | 300 | 0 | | |
| 11/13/01 | Dry | 100 | 1 | | | 11/13/01 | Dry | 200 | 1 | | |
| 11/20/01 | Wet | 100 | 1 | | | 11/20/01 | Wet | 200 | 1 | | |
| 11/26/01 | Wet | 630 | 0 | | | 11/26/01 | Wet | 1730 | 0 | | |
| 11/28/01 | Wet | 100 | 1 | | | 11/28/01 | Wet | 1180 | 0 | | |
| 12/03/01 | Dry | 100 | 1 | | | 12/03/01 | Dry | 520 | 0 | | |
| 12/06/01 | Wet | 410 | 0 | | | 12/06/01 | Wet | 310 | 0 | | |
| 12/11/01 | Dry | 100 | 1 | | | 12/11/01 | Dry | 200 | 1 | | |
| 12/17/01 | Wet | 23590 | 0 | | | 12/17/01 | Wet | 22240 | 0 | | |
| 12/19/01 | Wet | 300 | 0 | | | 12/19/01 | Wet | 960 | 0 | | |
| 05/01/02 | Dry | 32 | 1 | | | 05/01/02 | Dry | **10** | 1 | | |
| 5/7/2002 | Wet | 2650 | 0 | | | 5/7/2002 | Wet | 1850 | 0 | | |
| 5/14/2002 | Wet | 133 | 1 | | | 5/14/2002 | Wet | 800 | 0 | | |
| 5/21/2002 | Wet | 43 | 1 | | | 5/21/2002 | Wet | 84 | 1 | | |
| 5/28/2002 | Wet | 440 | 0 | | | 5/28/2002 | Wet | 557 | 0 | | |
| 6/3/2002 | Wet | **20** | 1 | | | 6/3/2002 | Wet | **20** | 1 | | |
| 6/10/2002 | Dry | 53 | 1 | | | 6/10/2002 | Dry | 80 | 1 | | |
| 6/12/2002 | Wet | 757 | 0 | | | 6/12/2002 | Wet | 1450 | 0 | | |
| 6/17/2002 | Wet | 140 | 1 | | | 6/17/2002 | Wet | 360 | 0 | | |
| 6/24/2002 | Dry | **10** | 1 | | | 6/24/2002 | Dry | 38 | 1 | | |
| 7/1/2002 | Dry | 300 | 0 | | | 7/1/2002 | Dry | 367 | 0 | | |
| 7/8/2002 | Dry | 106 | 1 | | | 7/8/2002 | Dry | 131 | 1 | | |
| 7/15/2002 | Dry | 50 | 1 | | | 7/15/2002 | Dry | 62 | 1 | | |
| 7/22/2002 | Wet | 267 | 0 | | | 7/22/2002 | Wet | 170 | 1 | | |
| 7/29/2002 | Wet | 100 | 1 | | | 7/29/2002 | Wet | 57 | 1 | | |
| 8/5/2002 | Dry | 50 | 1 | | | 8/5/2002 | Dry | 69 | 1 | | |
| 8/12/2002 | Dry | 56 | 1 | | | 8/12/2002 | Dry | 163 | 1 | | |
| 8/19/2002 | Wet | **100000** | 0 | | | 8/19/2002 | Wet | 44000 | 0 | | |
| 8/26/2002 | Wet | 130 | 1 | | | 8/26/2002 | Wet | 290 | 0 | | |
| 8/28/2002 | Dry | 123 | 1 | | | 8/28/2002 | Dry | 110 | 1 | | |
| 9/4/2002 | Dry | 80 | 1 | | | 9/4/2002 | Dry | 75 | 1 | | |
| 9/9/2002 | Dry | 200 | 1 | | | 9/9/2002 | Dry | 50 | 1 | | |
| 9/16/2002 | Wet | 600 | 0 | | | 9/16/2002 | Wet | 620 | 0 | | |
| 9/23/2002 | Wet | 900 | 0 | | | 9/23/2002 | Wet | 800 | 0 | | |
| 9/30/2002 | Dry | 220 | 1 | | | 9/30/2002 | Dry | 240 | 0 | | |
| 10/1/2002 | Dry | 130 | 1 | | | 10/1/2002 | Dry | 160 | 1 | | |
| 10/7/2002 | Dry | 700 | 0 | | | 10/7/2002 | Dry | 330 | 0 | | |
| 10/14/2002 | Wet | 137 | 1 | | | 10/14/2002 | Wet | 130 | 1 | | |
| 10/21/2002 | Wet | 320 | 0 | | | 10/21/2002 | Wet | 330 | 0 | | |
| 10/28/2002 | Dry | 1050 | 0 | | | 10/28/2002 | Dry | 1000 | 0 | | |

| MCHD Sampling Locations | | | | | |
|---|---|---|---|---|---|
| Stadium Drive | | | | | |
| Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) |
| 01/04/00 | Wet | 8000 | 0 | 05/02/00 | 8000 |
| 01/11/00 | Wet | 100 | 1 | 09/05/00 | 6630 |
| 01/12/00 | Dry | 100 | 1 | 09/12/00 | 54750 |
| 01/19/00 | Dry | 10 | 1 | | |
| 01/25/00 | Dry | 10 | 1 | | |
| 02/01/00 | Dry | 10 | 1 | | |
| 02/08/00 | Dry | 10 | 1 | | |
| 02/15/00 | Wet | 160 | 1 | | |
| 02/22/00 | Wet | 510 | 0 | | |
| 02/29/00 | Dry | 120 | 1 | | |
| 03/07/00 | Dry | 10 | 1 | | |
| 03/14/00 | Dry | 10 | 1 | | |
| 03/21/00 | Wet | 620 | 0 | | |
| 03/22/00 | Dry | 50 | 1 | | |
| 03/28/00 | Wet | 10 | 1 | | |
| 04/07/00 | Wet | 19000 | 0 | | |
| 04/11/00 | Wet | 200 | 1 | | |
| 04/18/00 | Wet | 1100 | 0 | | |
| 04/19/00 | Wet | 400 | 0 | | |
| 04/25/00 | Wet | 370 | 0 | | |
| 05/09/00 | Dry | 100 | 1 | | |
| 05/16/00 | Wet | 100 | 1 | | |
| 05/23/00 | Wet | 2900 | 0 | | |
| 05/31/00 | Dry | 360 | 0 | | |
| 06/06/00 | Wet | 390 | 0 | | |
| 06/13/00 | Wet | 270 | 0 | | |
| 06/14/00 | Dry | 390 | 0 | | |
| 06/20/00 | Dry | 690 | 0 | | |
| 06/27/00 | Wet | 410 | 0 | | |
| 07/05/00 | Wet | 4800 | 0 | | |
| 07/11/00 | Dry | 270 | 0 | | |
| 07/18/00 | Dry | 120 | 1 | | |
| 07/19/00 | Wet | 140 | 1 | | |
| 07/25/00 | Dry | 10 | 1 | | |
| 08/01/00 | Wet | 1300 | 0 | | |
| 08/08/00 | Wet | 12000 | 0 | | |
| 08/15/00 | Dry | 130 | 1 | | |
| 08/22/00 | Dry | 510 | 0 | | |
| 08/29/00 | Dry | 250 | 0 | | |
| 09/19/00 | Dry | 520 | 0 | | |
| 09/26/00 | Wet | 68670 | 0 | | |
| 09/27/00 | Wet | 3890 | 0 | | |
| 10/03/00 | Dry | 100 | 1 | | |
| 10/10/00 | Dry | 520 | 0 | | |
| 10/17/00 | Wet | 860 | 0 | | |
| 10/24/00 | Wet | 200 | 1 | | |
| 11/01/00 | Dry | 100 | 1 | | |
| 11/07/00 | Wet | 6770 | 0 | | |
| 11/08/00 | Wet | 5040 | 0 | | |
| 11/14/00 | Wet | 410 | 0 | | |
| 11/21/00 | Dry | 310 | 0 | | |
| 11/28/00 | Dry | 520 | 0 | | |
| 12/05/00 | Dry | 200 | 1 | | |
| 12/12/00 | Wet | 12740 | 0 | | |
| 12/13/00 | Wet | 1220 | 0 | | |
| 12/20/00 | Wet | 200 | 1 | | |
| 12/27/00 | Wet | 310 | 0 | | |
| 01/03/01 | Dry | 200 | 1 | | |
| 01/10/01 | Dry | 50 | 1 | | |
| 01/17/01 | Dry | 100 | 1 | | |
| 01/24/01 | Dry | 100 | 1 | | |
| 01/31/01 | Wet | 2920 | 0 | | |
| 02/06/01 | Wet | 100 | 1 | | |
| 02/14/01 | Wet | 100 | 1 | | |
| 02/19/01 | Dry | 100 | 1 | | |
| 02/21/01 | Dry | 100 | 1 | | |
| 02/28/01 | Dry | 520 | 0 | | |
| 03/06/01 | Dry | 200 | 1 | | |
| 03/14/01 | Wet | 100 | 1 | | |
| 03/19/01 | Dry | 410 | 0 | | |
| 03/21/01 | Dry | 200 | 1 | | |
| 03/27/01 | Dry | 100 | 1 | | |

| MCHD Sampling Locations | | | | | |
|---|---|---|---|---|---|
| Stadium Drive | | | | | |
| Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) |
| 04/03/01 | Dry | 100 | 1 | | |
| 04/10/01 | Wet | 100 | 1 | | |
| 04/16/01 | Wet | 200 | 1 | | |
| 04/18/01 | Dry | 100 | 1 | | |
| 04/24/01 | Wet | 200 | 1 | | |
| 05/01/01 | Dry | 100 | 1 | | |
| 05/09/01 | Wet | 129965 | 0 | | |
| 05/15/01 | Dry | 310 | 0 | | |
| 05/22/01 | Wet | 620 | 0 | | |
| 05/30/01 | Wet | 630 | 0 | | |
| 06/05/01 | Wet | 2780 | 0 | | |
| 06/12/01 | Dry | 300 | 0 | | |
| 06/19/01 | Dry | 730 | 0 | | |
| 06/20/01 | Wet | 17930 | 0 | | |
| 06/26/01 | Dry | 100 | 1 | | |
| 07/03/01 | Wet | 2280 | 0 | | |
| 07/10/01 | Wet | 1450 | 0 | | |
| 07/17/01 | Dry | 100 | 1 | | |
| 07/24/01 | Wet | 520 | 0 | | |
| 07/31/01 | Dry | 520 | 0 | | |
| 08/01/01 | Dry | 100 | 1 | | |
| 08/07/01 | Dry | 100 | 1 | | |
| 08/14/01 | Dry | 100 | 1 | | |
| 08/21/01 | Wet | 3360 | 0 | | |
| 08/28/01 | Dry | 520 | 0 | | |
| 09/05/01 | Dry | 200 | 1 | | |
| 09/11/01 | Wet | 1710 | 0 | | |
| 09/18/01 | Wet | 510 | 0 | | |
| 09/25/01 | Wet | 4220 | 0 | | |
| 09/26/01 | Dry | 1870 | 0 | | |
| 10/02/01 | Dry | 100 | 1 | | |
| 10/09/01 | Dry | 2060 | 0 | | |
| 10/16/01 | Wet | 5040 | 0 | | |
| 10/23/01 | Wet | 200 | 1 | | |
| 10/30/01 | Dry | 410 | 0 | | |
| 11/06/01 | Dry | 410 | 0 | | |
| 11/13/01 | Dry | 100 | 1 | | |
| 11/20/01 | Wet | 310 | 0 | | |
| 11/26/01 | Wet | 2180 | 0 | | |
| 11/28/01 | Wet | 1350 | 0 | | |
| 12/03/01 | Dry | 100 | 1 | | |
| 12/06/01 | Wet | 200 | 1 | | |
| 12/11/01 | Dry | 100 | 1 | | |
| 12/17/01 | Wet | 13960 | 0 | | |
| 12/19/01 | Wet | 310 | 0 | | |
| 05/01/02 | Dry | **10** | 1 | | |
| 5/7/2002 | Wet | 3400 | 0 | | |
| 5/14/2002 | Wet | 540 | 0 | | |
| 5/21/2002 | Wet | 84 | 1 | | |
| 5/28/2002 | Wet | 1400 | 0 | | |
| 6/3/2002 | Wet | 40 | 1 | | |
| 6/10/2002 | Dry | 173 | 1 | | |
| 6/12/2002 | Wet | 4400 | 0 | | |
| 6/17/2002 | Wet | 120 | 1 | | |
| 6/24/2002 | Dry | 88 | 1 | | |
| 7/1/2002 | Dry | 300 | 0 | | |
| 7/8/2002 | Dry | 50 | 1 | | |
| 7/15/2002 | Dry | 75 | 1 | | |
| 7/22/2002 | Wet | 293 | 0 | | |
| 7/29/2002 | Wet | 44 | 1 | | |
| 8/5/2002 | Dry | 25 | 1 | | |
| 8/12/2002 | Dry | 20 | 1 | | |
| 8/19/2002 | Wet | 19000 | 0 | | |
| 8/26/2002 | Wet | 210 | 1 | | |
| 8/28/2002 | Dry | 130 | 1 | | |
| 9/4/2002 | Dry | 37 | 1 | | |
| 9/9/2002 | Dry | 40 | 1 | | |
| 9/16/2002 | Wet | 580 | 0 | | |
| 9/23/2002 | Wet | 200 | 1 | | |
| 9/30/2002 | Dry | 127 | 1 | | |
| 10/1/2002 | Dry | 120 | 1 | | |
| 10/7/2002 | Dry | 260 | 0 | | |
| 10/14/2002 | Wet | 65 | 1 | | |
| 10/21/2002 | Wet | 700 | 0 | | |
| 10/28/2002 | Dry | 367 | 0 | | |

| MCHD Sampling Locations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 46th Street | | | | | | Boyscout Raod | | | | | |
| Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) | Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | Date | Questionable Data (col/100 mL) |
| **05/01/02** | Dry | **10** | 1 | | | **05/01/02** | Dry | **10** | 1 | | |
| **5/7/2002** | Wet | 720 | 0 | | | **5/7/2002** | Wet | 620 | 0 | | |
| **5/14/2002** | Wet | 133 | 1 | | | **5/14/2002** | Wet | 200 | 1 | | |
| **5/21/2002** | Wet | 8 | 1 | | | **5/21/2002** | Wet | **4** | 1 | | |
| **5/28/2002** | Wet | 27 | 1 | | | **5/28/2002** | Wet | **20** | 1 | | |
| **6/3/2002** | Wet | 173 | 1 | | | **6/3/2002** | Wet | 27 | 1 | | |
| **6/10/2002** | Dry | **20** | 1 | | | **6/10/2002** | Dry | **20** | 1 | | |
| **6/12/2002** | Wet | 173 | 1 | | | **6/12/2002** | Wet | **20** | 1 | | |
| **6/17/2002** | Wet | 81 | 1 | | | **6/17/2002** | Wet | 38 | 1 | | |
| **6/24/2002** | Dry | 75 | 1 | | | **6/24/2002** | Dry | 31 | 1 | | |
| **7/1/2002** | Dry | 106 | 1 | | | **7/1/2002** | Dry | 75 | 1 | | |
| **7/8/2002** | Dry | 31 | 1 | | | **7/8/2002** | Dry | 38 | 1 | | |
| **7/15/2002** | Dry | 56 | 1 | | | **7/15/2002** | Dry | 31 | 1 | | |
| **7/22/2002** | Wet | 56 | 1 | | | **7/22/2002** | Wet | 140 | 1 | | |
| **7/29/2002** | Wet | 113 | 1 | | | **7/29/2002** | Wet | 48 | 1 | | |
| **8/5/2002** | Dry | 69 | 1 | | | **8/5/2002** | Dry | 94 | 1 | | |
| **8/12/2002** | Dry | 80 | 1 | | | **8/12/2002** | Dry | 84 | 1 | | |
| **8/19/2002** | Wet | 2800 | 0 | | | **8/19/2002** | Wet | 1300 | 0 | | |
| **8/26/2002** | Wet | 180 | 1 | | | **8/26/2002** | Wet | 104 | 1 | | |
| **8/28/2002** | Dry | 135 | 1 | | | **8/28/2002** | Dry | 60 | 1 | | |
| **9/4/2002** | Dry | 51 | 1 | | | **9/4/2002** | Dry | 45 | 1 | | |
| **9/9/2002** | Dry | 87 | 1 | | | **9/9/2002** | Dry | 55 | 1 | | |
| **9/16/2002** | Wet | 260 | 0 | | | **9/16/2002** | Wet | 85 | 1 | | |
| **9/23/2002** | Wet | 280 | 0 | | | **9/23/2002** | Wet | 200 | 1 | | |
| **9/30/2002** | Dry | 167 | 1 | | | **9/30/2002** | Dry | 120 | 1 | | |
| **10/1/2002** | Dry | 170 | 1 | | | **10/1/2002** | Dry | 110 | 1 | | |
| **10/7/2002** | Dry | 180 | 1 | | | **10/7/2002** | Dry | 160 | 1 | | |
| **10/14/2002** | Wet | 135 | 1 | | | **10/14/2002** | Wet | 41 | 1 | | |
| **10/21/2002** | Wet | 69 | 1 | | | **10/21/2002** | Wet | 41 | 1 | | |
| **10/28/2002** | Dry | 28 | 1 | | | **10/28/2002** | Dry | 78 | 1 | | |

| MCHD Sampling Locations | | | | | |
|---|---|---|---|---|---|
| Date | Wet or Dry? | 5700 Fall Creek Parkway | | 4500 Fall Creek Parkway | |
| | | E. Coli (col/100 mL) | % Compliance | E. Coli (col/100 mL) | % Compliance |
| 4/18/2000 | Wet | 100 | 1 | 100 | 1 |
| 5/2/2000 | Wet | 390 | 0 | 410 | 0 |
| 6/6/2000 | Wet | 240 | 0 | 390 | 0 |
| 7/11/2000 | Dry | 580 | 0 | 240 | 0 |
| 8/8/2000 | Wet | 900 | 0 | 600 | 0 |
| 9/5/2000 | Wet | 970 | 0 | 980 | 0 |
| 11/1/2000 | Dry | 100 | 1 | 100 | 1 |
| 4/10/2001 | Dry | 100 | 1 | 100 | 1 |
| 5/9/2001 | Wet | 1450 | 0 | 3090 | 0 |
| 6/12/2001 | Dry | 100 | 1 | 100 | 1 |
| 7/10/2001 | Wet | 520 | 0 | 840 | 0 |
| 8/7/2001 | Dry | 740 | 0 | 410 | 0 |
| 9/11/2001 | Wet | 310 | 0 | 740 | 0 |
| 10/9/2001 | Dry | 310 | 0 | 100 | 1 |

| IDEM Sampling Data | | | | | |
|---|---|---|---|---|---|
| | | Keystone Ave | | Stadium Drive | |
| Date | Wet or Dry? | E. Coli (col/100 mL) | % Compliance | E. Coli (col/100 mL) | % Compliance |
| **1/11/2000** | Wet | 240 | 0 | 87 | 1 |
| **2/10/2000** | Wet | 190 | 1 | 8 | 1 |
| **3/2/2000** | Wet | 29 | 1 | 220 | 1 |
| **4/20/2000** | Wet | 96 | 1 | 410 | 0 |
| **5/8/2000** | Wet | 190 | 1 | 4600 | 0 |
| **6/13/2000** | Wet | 125 | 1 | 100 | 1 |
| **7/20/2000** | Wet | 140 | 1 | 29 | 1 |
| **8/9/2000** | Wet | 550 | 0 | 1300 | 0 |
| **9/7/2000** | Dry | 430 | 0 | 490 | 0 |
| **10/26/2000** | Dry | 50 | 1 | 78 | 1 |
| **11/30/2000** | Dry | 56 | 1 | 130 | 1 |
| **12/20/2000** | Wet | 86 | 1 | 410 | 0 |
| **5/1/2002** | Dry | **10** | 1 | **10** | 1 |
| **5/7/2002** | Wet | 560 | 0 | 3400 | 0 |
| **5/14/2002** | Wet | 187 | 1 | 540 | 0 |
| **5/21/2002** | Wet | 16 | 1 | 84 | 1 |
| **5/28/2002** | Wet | 133 | 1 | 1400 | 0 |
| **6/3/2002** | Wet | 53 | 1 | 40 | 1 |
| **6/10/2002** | Dry | **20** | 1 | 173 | 1 |
| **6/12/2002** | Wet | 420 | 0 | 4400 | 0 |
| **6/17/2002** | Wet | 94 | 1 | 120 | 1 |
| **6/24/2002** | Dry | 69 | 1 | 88 | 1 |
| **7/1/2002** | Dry | 200 | 1 | 300 | 0 |
| **7/8/2002** | Dry | 100 | 1 | 50 | 1 |
| **7/15/2002** | Dry | 19 | 1 | 75 | 1 |
| **7/22/2002** | Wet | 148 | 1 | 293 | 0 |
| **7/29/2002** | Wet | 96 | 1 | 44 | 1 |
| **8/5/2002** | Dry | 50 | 1 | 25 | 1 |
| **8/12/2002** | Dry | 92 | 1 | 20 | 1 |
| **8/19/2002** | Wet | 760 | 0 | 19000 | 0 |
| **8/26/2002** | Wet | 60 | 1 | 210 | 1 |
| **8/28/2002** | Dry | 95 | 1 | 130 | 1 |
| **9/4/2002** | Dry | 34 | 1 | 37 | 1 |
| **9/9/2002** | Dry | 75 | 1 | 40 | 1 |
| **9/16/2002** | Wet | 240 | 0 | 580 | 0 |
| **9/23/2002** | Wet | 230 | 1 | 200 | 1 |
| **9/30/2002** | Dry | 160 | 1 | 127 | 1 |
| **10/1/2002** | Dry | 240 | 0 | 120 | 1 |
| **10/7/2002** | Dry | 143 | 1 | 260 | 0 |
| **10/14/2002** | Wet | 120 | 1 | 65 | 1 |
| **10/21/2002** | Wet | 47 | 1 | 700 | 0 |
| **10/28/2002** | Dry | 80 | 1 | 367 | 0 |

| Date | Dry/Wet? | Fall Creek Rd - Mud Creek | | 96th Street - Mud Creek | |
|---|---|---|---|---|---|
| | | E coli | Compliance | E coli | Compliance |
| 05/01/02 | Dry | **10** | 1 | 32 | 1 |
| 5/7/2002 | Wet | 900 | 0 | 920 | 0 |
| 5/14/2002 | Wet | 213 | 1 | 400 | 0 |
| 5/21/2002 | Wet | **4** | 1 | 5 | 1 |
| 5/28/2002 | Wet | 227 | 1 | 860 | 0 |
| 6/3/2002 | Wet | 67 | 1 | 107 | 1 |
| 6/10/2002 | Dry | 40 | 1 | 253 | 0 |
| 6/12/2002 | Wet | 93 | 1 | 187 | 1 |
| 6/17/2002 | Wet | 94 | 1 | 210 | 1 |
| 6/24/2002 | Dry | 88 | 1 | 170 | 1 |
| 7/1/2002 | Dry | 290 | 0 | 310 | 0 |
| 7/8/2002 | Dry | 12 | 1 | 75 | 1 |
| 7/15/2002 | Dry | 38 | 1 | 44 | 1 |
| 7/22/2002 | Wet | 88 | 1 | 140 | 1 |
| 7/29/2002 | Wet | 128 | 1 | 84 | 1 |
| 8/5/2002 | Dry | 200 | 1 | 150 | 1 |
| 8/12/2002 | Dry | 88 | 1 | 84 | 1 |
| 8/19/2002 | Wet | 5500 | 0 | 8333 | 0 |
| 8/26/2002 | Wet | 130 | 1 | 120 | 1 |
| 8/28/2002 | Dry | 100 | 1 | 110 | 1 |
| 9/4/2002 | Dry | 120 | 1 | 57 | 1 |
| 9/9/2002 | Dry | 157 | 1 | 57 | 1 |
| 9/16/2002 | Wet | 125 | 1 | 160 | 1 |
| 9/23/2002 | Wet | 180 | 1 | 280 | 0 |
| 9/30/2002 | Dry | 120 | 1 | 260 | 0 |
| 10/1/2002 | Dry | 150 | 1 | 190 | 1 |
| 10/7/2002 | Dry | 115 | 1 | 115 | 1 |
| 10/14/2002 | Wet | 70 | 1 | 110 | 1 |
| 10/21/2002 | Wet | 59 | 1 | 66 | 1 |
| 10/28/2002 | Dry | 65 | 1 | 80 | 1 |

| Date | Dry/Wet? | 86th Street - Mud Creek | | 82nd Street - Mud Creek | |
|---|---|---|---|---|---|
| | | E coli | Compliance | E coli | Compliance |
| 05/01/02 | Dry | 32 | 1 | **10** | 1 |
| 5/7/2002 | Wet | 1550 | 0 | 1500 | 0 |
| 5/14/2002 | Wet | 340 | 0 | 227 | 1 |
| 5/21/2002 | Wet | 38 | 1 | 38 | 1 |
| 5/28/2002 | Wet | 980 | 0 | 500 | 0 |
| 6/3/2002 | Wet | 53 | 1 | 53 | 1 |
| 6/10/2002 | Dry | 147 | 1 | 107 | 1 |
| 6/12/2002 | Wet | 67 | 1 | **20** | 1 |
| 6/17/2002 | Wet | 94 | 1 | 106 | 1 |
| 6/24/2002 | Dry | 100 | 1 | 12 | 1 |
| 7/1/2002 | Dry | 44 | 1 | 230 | 1 |
| 7/8/2002 | Dry | 69 | 1 | 56 | 1 |
| 7/15/2002 | Dry | 44 | 1 | 50 | 1 |
| 7/22/2002 | Wet | 48 | 1 | 60 | 1 |
| 7/29/2002 | Wet | 64 | 1 | 96 | 1 |
| 8/5/2002 | Dry | 81 | 1 | 94 | 1 |
| 8/12/2002 | Dry | 80 | 1 | 112 | 1 |
| 8/19/2002 | Wet | 6500 | 0 | 7500 | 0 |
| 8/26/2002 | Wet | 120 | 1 | 72 | 1 |
| 8/28/2002 | Dry | 120 | 1 | 85 | 1 |
| 9/4/2002 | Dry | 26 | 1 | 300 | 0 |
| 9/9/2002 | Dry | 70 | 1 | 173 | 1 |
| 9/16/2002 | Wet | 133 | 1 | 117 | 1 |
| 9/23/2002 | Wet | 150 | 1 | 220 | 1 |
| 9/30/2002 | Dry | 170 | 1 | 163 | 1 |
| 10/1/2002 | Dry | 137 | 1 | 130 | 1 |
| 10/7/2002 | Dry | 135 | 1 | 130 | 1 |
| 10/14/2002 | Wet | 125 | 1 | 130 | 1 |
| 10/21/2002 | Wet | 95 | 1 | 100 | 1 |
| 10/28/2002 | Dry | 47 | 1 | 47 | 1 |

| Date | Dry/Wet? | Lantern Rd - Mud Creek | |
|---|---|---|---|
| | | E coli | Compliance |
| 05/01/02 | Dry | 40 | 1 |
| 5/7/2002 | Wet | 950 | 0 |
| 5/14/2002 | Wet | 253 | 0 |
| 5/21/2002 | Wet | 27 | 1 |
| 5/28/2002 | Wet | 267 | 0 |
| 6/3/2002 | Wet | 27 | 1 |
| 6/10/2002 | Dry | 107 | 1 |
| 6/12/2002 | Wet | 93 | 1 |
| 6/17/2002 | Wet | | 1 |
| 6/24/2002 | Dry | 138 | 1 |
| 7/1/2002 | Dry | 112 | 1 |
| 7/8/2002 | Dry | 38 | 1 |
| 7/15/2002 | Dry | 44 | 1 |
| 7/22/2002 | Wet | | 1 |
| 7/29/2002 | Wet | 84 | 1 |
| 8/5/2002 | Dry | 140 | 1 |
| 8/12/2002 | Dry | 64 | 1 |
| 8/19/2002 | Wet | 15000 | 0 |
| 8/26/2002 | Wet | 104 | 1 |
| 8/28/2002 | Dry | 100 | 1 |
| 9/4/2002 | Dry | 117 | 1 |
| 9/9/2002 | Dry | 50 | 1 |
| 9/16/2002 | Wet | 65 | 1 |
| 9/23/2002 | Wet | 200 | 1 |
| 9/30/2002 | Dry | 120 | 1 |
| 10/1/2002 | Dry | 115 | 1 |
| 10/7/2002 | Dry | 120 | 1 |
| 10/14/2002 | Wet | 70 | 1 |
| 10/21/2002 | Wet | 70 | 1 |
| 10/28/2002 | Dry | 56 | 1 |

| Date | Dry/Wet? | Radnor Rd - Devon Creek | | Millersville Rd - Devon Creek | |
|---|---|---|---|---|---|
| | | E coli | Compliance | E coli | Compliance |
| **05/01/02** | Dry | 24 | 1 | **10** | 1 |
| **05/07/02** | Wet | 7400 | 0 | 5800 | 0 |
| **05/14/02** | Wet | 480 | 0 | 460 | 0 |
| **05/21/02** | Wet | 49 | 1 | 24 | 1 |
| **05/28/02** | Wet | 5400 | 0 | 700 | 0 |
| **06/03/02** | Wet | 213 | 1 | 53 | 1 |
| **06/10/02** | Dry | 720 | 0 | 280 | 0 |
| **06/12/02** | Wet | 2150 | 0 | 2053 | 0 |
| **06/17/02** | Wet | 420 | 0 | 500 | 0 |
| **06/24/02** | Dry | 340 | 0 | 330 | 0 |
| **07/01/02** | Dry | 2200 | 0 | 700 | 0 |
| **07/08/02** | Dry | 150 | 1 | 333 | 0 |
| **07/15/02** | Dry | 120 | 1 | 187 | 1 |
| **07/22/02** | Wet | 220 | 1 | 84 | 1 |
| **07/29/02** | Wet | 320 | 0 | | |
| **08/05/02** | Dry | 560 | 0 | | |
| **08/12/02** | Dry | 580 | 0 | | |
| **08/19/02** | Wet | 6500 | 0 | 9000 | 0 |
| **08/26/02** | Wet | 200 | 1 | | |
| **08/28/02** | Dry | 267 | 0 | | |
| **09/04/02** | Dry | 135 | 1 | | |
| **09/09/02** | Dry | 293 | 0 | | |
| **09/16/02** | Wet | 183 | 1 | | |
| **09/23/02** | Wet | 120 | 1 | 240 | 0 |
| **09/30/02** | Dry | 283 | 0 | 110 | 1 |
| **10/01/02** | Dry | 220 | 1 | 220 | 1 |
| **10/07/02** | Dry | 308 | 0 | 290 | 0 |
| **10/14/02** | Wet | 330 | 0 | | |
| **10/21/02** | Wet | 70 | 1 | | |
| **10/28/02** | Dry | 160 | 1 | 123 | 1 |

| Date | Dry/Wet? | Schafter Rd - Lawrence Creek | |
|---|---|---|---|
| | | E coli | Compliance |
| **05/01/02** | Dry | 16 | 1 |
| **05/07/02** | Wet | 2600 | 0 |
| **05/14/02** | Wet | 147 | 1 |
| **05/21/02** | Wet | 19 | 1 |
| **05/28/02** | Wet | 80 | 1 |
| **06/03/02** | Wet | 120 | 1 |
| **06/10/02** | Dry | **20** | 1 |
| **06/12/02** | Wet | 173 | 1 |
| **06/17/02** | Wet | 25 | 1 |
| **06/24/02** | Dry | 44 | 1 |
| **07/01/02** | Dry | 160 | 1 |
| **07/08/02** | Dry | 180 | 1 |
| **07/15/02** | Dry | 100 | 1 |
| **07/22/02** | Wet | 55 | 1 |
| **07/29/02** | Wet | 313 | 0 |
| **08/05/02** | Dry | 150 | 1 |
| **08/12/02** | Dry | 120 | 1 |
| **08/19/02** | Wet | 7000 | 0 |
| **08/26/02** | Wet | 64 | 1 |
| **08/28/02** | Dry | 105 | 1 |
| **09/04/02** | Dry | 48 | 1 |
| **09/09/02** | Dry | 293 | 0 |
| **09/16/02** | Wet | 200 | 1 |
| **09/23/02** | Wet | 150 | 1 |
| **09/30/02** | Dry | 226 | 1 |
| **10/01/02** | Dry | 240 | 0 |
| **10/07/02** | Dry | 167 | 1 |
| **10/14/02** | Wet | 75 | 1 |
| **10/21/02** | Wet | 133 | 1 |
| **10/28/02** | Dry | 100 | 1 |